CERTIFICATION TEST REPORT

Report Number. : 4790302422-E6V1

Applicant : SAMSUNG ELECTRONICS CO., LTD.
129 SAMSUNG-RO, YEONGTONG-GU, SUWON-SI,
GYEONGGI-DO, 16677, KOREA

Model : SM-A136M/DS, SM-A136M

FCC ID : A3LSMA136M

EUT Description : GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac

Test Standard(s) : FCC 47 CFR PART 15 SUBPART C

Date Of Issue:
2022-05-09

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TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	2022-05-09	Initial issue	Sungeun Lee

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME:	SAMSUNG ELECTRONICS CO., LTD.
EUT DESCRIPTION:	GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac
MODEL:	SM-A136M/DS, SM-A136M
SERIAL NUMBER:	R3CT206R5SN, R3CT206R6MX (CONDUCTED); R3CT206R7PM, R3CT206R5VJ (RADIATED);
DATE TESTED:	2022-02-16 ~ 2022-03-31; (Original) 2022-04-01 ~ 2022-04-12; (Spot-Check)

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C	Complies

UL Korea, Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Korea, Ltd. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Korea, Ltd. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Korea, Ltd. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by IAS, any agency of the Federal Government, or any agency of any government.

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Suwon Lab Engineer
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Tested By:

Sungeun Lee
Suwon Lab Engineer
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1.1. INTRODUCTION OF TEST DATA REUSE

This report referenced from the FCC ID: A3LSMA136M BT (FCC CFR 47 Part 15C). And the applicant takes full responsibility that the test data as referenced in this report represent compliance for this FCC ID.

1.2. DIFFERENCE

The FCC ID: A3LSMA136M shares the same enclosure and circuit board as FCC ID: A3LSMA136B. The BT antennas and surrounding circuitry and layout are identical between these two units.

After confirming through preliminary radiated emissions that the performance of the FCC ID: A3LSMA136B remains representative of FCC ID: A3LSMA136M. The test data of FCC ID: A3LSMA136B being submitted for this application to cover BT features.

1.3. SPOT CHECK VERIFICATION DATA

(Worst case of the radiated band-edge and radiated spurious emissions)

Band	Test Item	Mode	Frequency	Test Limit	Original model	Spot check model	Deviation	Remark
					SM-A136B/DSN Results	SM-A136M/DS Results		
					FCC ID : A3LSMA136B	FCC ID : A3LSMA136M		
DSS BT (2.4GHz)	Band Edge	GFSK 2480	2480 MHz	54 dBuV/m	42.89 dBuV/m	43.10 dBuV/m	0.21 dB	
	RSE	GFSK 2441	9764 MHz	74 dBuV/m	44.16 dBuV/m	43.80 dBuV/m	-0.36 dB	

Comparison of two models, upper deviation is within 3 dB range and all test results are under FCC Technical Limits.

1.4. REFERENCE DETAIL

Reference application that contains the reused reference data in the individual test reports:

Equipment Class	Reference FCC ID (Parent)	Application Type	Reference Test report number	Exhibit Type	Variant Test Report Number	Data Re-used
WWAN	A3LSMA136B	Original Grant	4790302419 -E2 (WWAN)	Test Report	4790302422-E3 (WWAN)	All
DTS	A3LSMA136B	Original Grant	4790302419 -E3 (802.11b/g/n)	Test Report	4790302422-E4 (802.11b/g/n)	All
			4790302419-E4 Bluetooth LE	Test Report	4790302422-E5 Bluetooth LE	All
DSS	A3LSMA136B	Original Grant	4790302419-E5 (Bluetooth)	Test Report	4790302422-E6 (Bluetooth)	All
NII	A3LSMA136B	Original Grant	4790302419-E6 (802.11a/n/ac)	Test Report	4790302422-E7 (802.11a/n/ac)	All

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2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with following methods.

1. FCC CFR 47 Part 2.
2. FCC CFR 47 Part 15.
3. KDB 558074 D01 15.247 Meas Guidance v05r02.
4. ANSI C63.10-2013.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro
☒ Chamber 1(3m semi-anechoic chamber)
☒ Chamber 2(3m semi-anechoic chamber)
☒ Chamber 3(3m semi-anechoic chamber)
☐ Chamber 4(3m Full-anechoic chamber)
☐ Chamber 5(3m Full-anechoic chamber)

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at https://www.iasonline.org/wp-content/uploads/2017/05/TL-637-cert-New.pdf.

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4. DECISION RULES AND MEASUREMENT UNCERTAINTY

4.1. METROLOGICAL TRACEABILITY

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)
36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	3.02 dB
Radiated Disturbance, 30 MHz to 1 GHz	4.05 dB
Radiated Disturbance, 1 GHz to 18 GHz	5.78 dB
Radiated Disturbance, 18 GHz to 40 GHz	5.58 dB

Uncertainty figures are valid to a confidence level of 95%.

4.4. DECISION RULES

Decision rule for statement(s) of conformity is based on Procedure 2, Clause 4.4.3 in IEC Guide 115:2007.

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5. EQUIPMENT UNDER TEST

5.1. EUT DESCRIPTION

The EUT is a GSM/WCDMA/LTE/5G NR Phone + BT/BLE, DTS/UNII a/b/g/n/ac and NFC.
This test report addresses the BT(DSS) operational mode.

This report covers the Samsung models SM-A136M/DS and SM-A136M.
These models are identical in hardware except SM-A136M has single SIM tray.
With some pre-scan, model SM-A136M/DS was set for final test.

5.2. MAXIMUM OUTPUT POWER

The transmitter has a maximum peak conducted output power as follows:

Frequency Range [MHz]	Mode	Power Mode	Output Power [dBm]	Output Power [mW]
2 402 ~ 2 480	Basic GFSK	Peak	**10.986**	**12.549**
		Average	10.307	10.732
	Enhanced Pi/4-DPSK	Peak	10.278	10.661
		Average	8.142	6.519
	Enhanced 8PSK	Peak	10.289	10.688
		Average	8.161	6.548

5.3. DESCRIPTION OF AVAILABLE ANTENNAS

An intentional radiator antenna shall be designed to ensure that no antenna other than that furnished by the responsible party can be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section.

The internal antenna was Permanently attached.
Therefore this E.U.T Complies with the requirement of §15.203.

The radio utilizes an internal antennas with ANT maximum gain of -4.15 dBi

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5.4. WORST-CASE CONFIGURATION AND MODE

Radiated emission below 1GHz and power line conducted emission were performed with the EUT set to transmit at the channel with highest output power as worst-case scenario.

Radiated emission above 1GHz was performed with the EUT set to transmit low/mid/high channels.

The fundamental of the EUT was investigated in three orthogonal orientations X, Y and Z it was determined that X orientation was worst-case orientation; therefore, all final radiated testing was performed with the EUT in X orientation.

GFSK, Pi/4-DQPSK, 8PSK average Power are all investigated, The GFSK & 8PSK Power are the worst case. Testing is based on this mode to showing compliance.

5.5. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT

Support Equipment List				
Description	**Manufacturer**	**Model**	**Serial Number**	**FCC ID**
Charger	SAMSUNG	EP-TA800	R37MANQ1E72SE3	N/A
Data Cable	SAMSUNG	EP-DN980	GH39-02115A BWE	N/A
Charger	SAMSUNG	EP-TA200	R37KC6F39T1SE3	N/A
Data Cable	SAMSUNG	EP-DR140AWE	GH39-01999A	N/A
Earphone	SAMSUNG	GH59-15055A	EHS64AVFWE	N/A

I/O CABLE

I/O Cable List						
Cable No.	**Port**	**# of identical ports**	**Connector Type**	**Cable Type**	**Cable Length (m)**	**Remarks**
1	DC Power	1	C to C Type	Shielded	1.0 m	N/A
2	DC Power	1	A to C Type	Shielded	1.0 m	N/A
3	Audio	2	Mini-Jack	Unshielded	0.7 m	N/A

TEST SETUP

The EUT is continuously communicating to the Bluetooth tester during the tests.
Test software enable BT communications.

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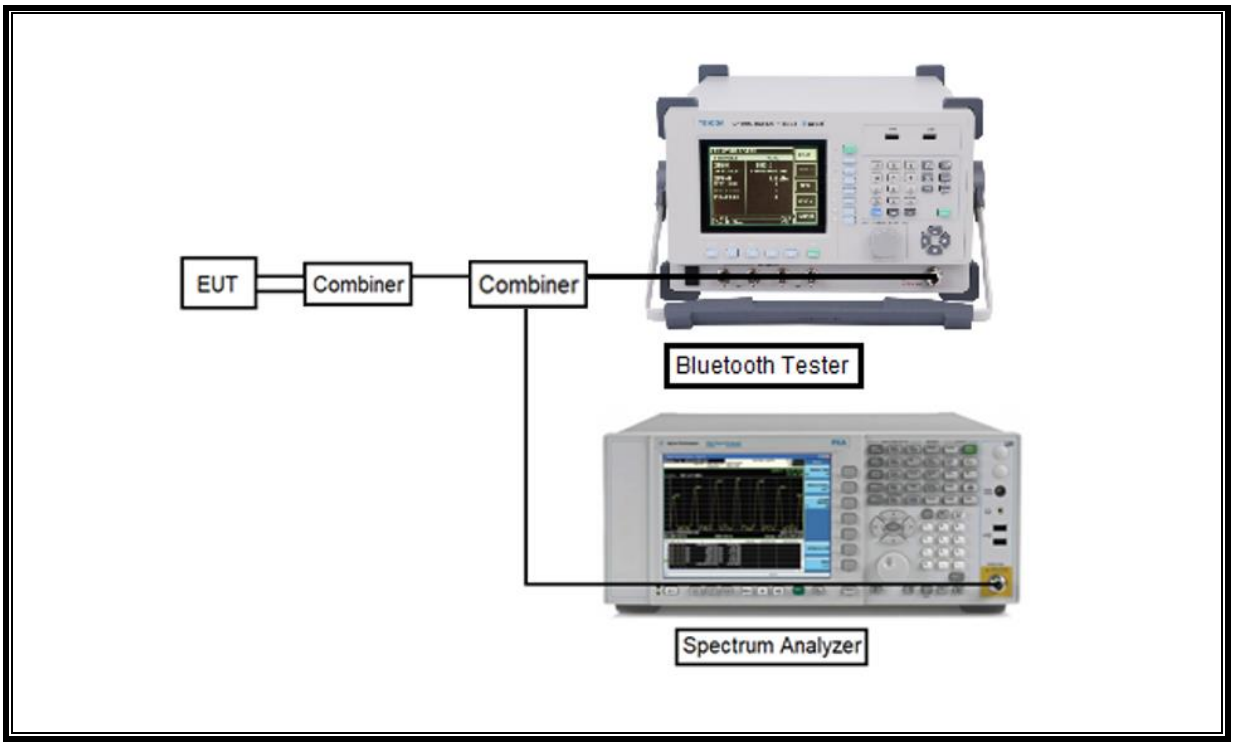
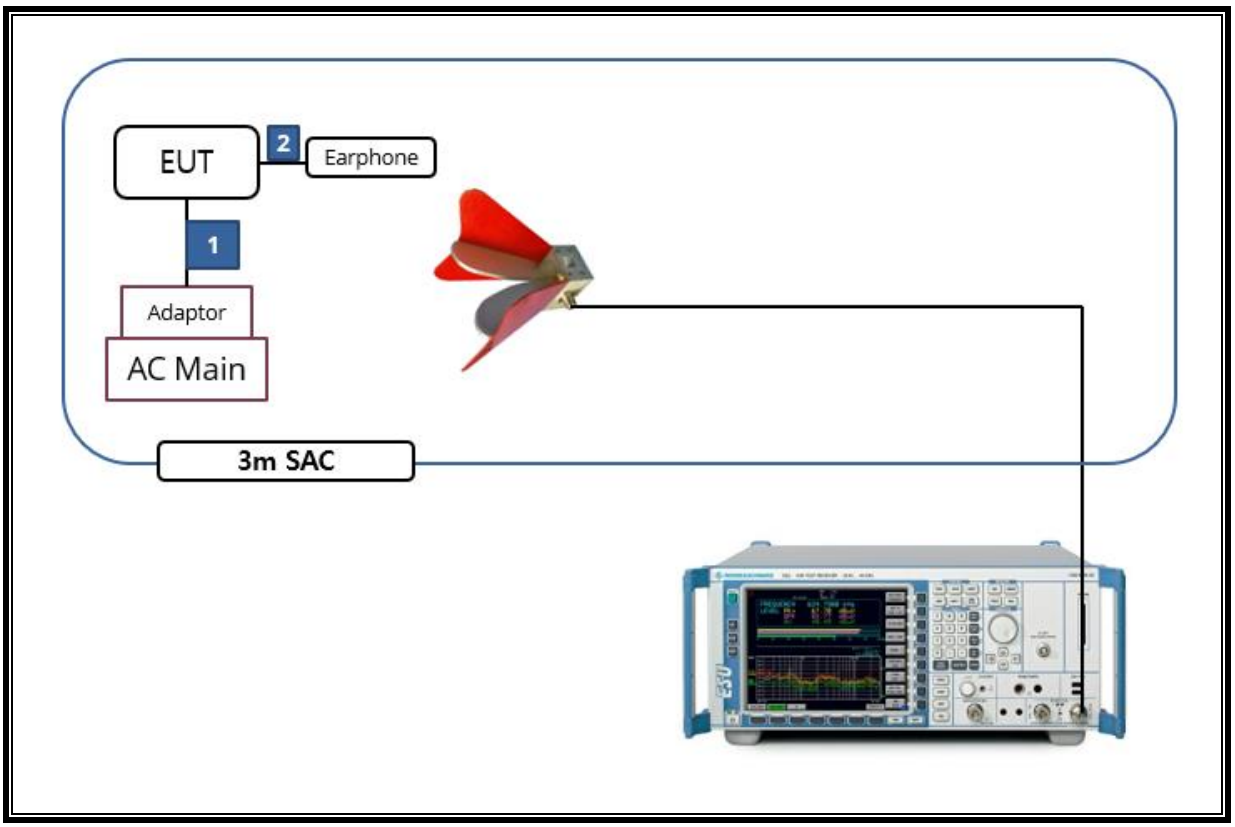
SETUP DIAGRAM FOR TESTS (CONDUCTED TEST SETUP)



SETUP DIAGRAM FOR TESTS (RADIATED TEST SETUP)



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6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	**Manufacturer**	**Model**	**S/N**	**Cal Due**
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	2022/08/19
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	2022/08/13
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	2022/08/13
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	2023/10/06
Antenna, Horn, 18 GHz	ETS	3115	00167211	2022/07/27
Antenna, Horn, 18 GHz	ETS	3115	00161451	2022/08/15
Antenna, Horn, 18 GHz	ETS	3117	00168724	2022/07/27
Antenna, Horn, 18 GHz	ETS	3117	00168717	2022/08/15
Antenna, Horn, 40 GHz	ETS	3116C	00166155	2022/08/04
Preamplifier	ETS	3116C-PA	00168841	2022/08/04
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	80108-0004	N/A
Directional Antenna	Cobham	FPA3-0.8-6.0R/1329	110367-0003	N/A
Preamplifier, 1000 MHz	Sonoma	310N	341282	2022/08/02
Preamplifier, 1000 MHz	Sonoma	310N	351741	2022/08/02
Preamplifier, 1000 MHz	Sonoma	310N	370599	2022/08/02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1876511	2022/08/02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	1896138	2022/08/02
Preamplifier, 18 GHz	Miteq	AFS42-00101800-25-S-42	2029168	2022/08/02
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54170614	2022/08/04
Spectrum Analyzer, 44 GHz	Agilent / HP	N9030A	MY54490312	2022/08/04
Average Power Sensor	Agilent / HP	U2000	MY54270007	2022/08/04
Average Power Sensor	Agilent / HP	U2000	MY54260010	2022/08/04
Bluetooth Tester	TESCOM	TC-3000C	3000C000546	2022/08/04
Power Splitter	MINI-CIRCUITS	WA1534	UL003	2023/01/11
Power Splitter	MINI-CIRCUITS	WA1534	UL004	2023/01/11
Attenuator	PASTERNACK	PE7087-10	A009	2022/08/03
Attenuator	PASTERNACK	PE7087-10	A001	2022/08/03
Attenuator	PASTERNACK	PE7087-10	A008	2022/08/03
Attenuator	PASTERNACK	PE7004-10	2	2022/08/02
EMI Test Receive, 40 GHz	R&S	ESU40	100439	2022/08/02
EMI Test Receive, 40 GHz	R&S	ESU40	100457	2022/08/02
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	009	2022/08/02
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	015	2022/08/02
Low Pass Filter 5GHz	Micro-Tronics	LPS17541	019	2022/08/02
High Pass Filter 3GHz	Micro-Tronics	HPM17543	010	2022/08/02
High Pass Filter 3GHz	Micro-Tronics	HPM17543	015	2022/08/02
High Pass Filter 3GHz	Micro-Tronics	HPM17543	020	2022/08/02
High Pass Filter 6GHz	Micro-Tronics	HPS17542	009	2022/08/02
High Pass Filter 6GHz	Micro-Tronics	HPS17542	016	2022/08/02
High Pass Filter 6GHz	Micro-Tronics	HPS17542	020	2022/08/02
LISN	R&S	ENV-216	101837	2022/08/05
Termination	WEINSCHEL	M1406A	T09	2022/08/03
UL Software				
Description	**Manufacturer**	**Model**	**Version**	
Radiated software	UL	UL EMC	Ver 9.5	
AC Line Conducted software	UL	UL EMC	Ver 9.5	

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7. TEST RESULTS SUMMARY

FCC Part Section	Test Description	Test Limit	Test Condition	Test Result
2.1051, 15.247(d)	Band Edge / Conducted Spurious Emission	-20 dBc	Conducted	PASS
15.247 (b)(1)	TX conducted output power	< 21 dBm		PASS
15.247 (a)(1)	Hopping frequency separation	> two-thirds of the 20 dB bandwidth		PASS
15.247 (a)(1)(iii)	Number of Hopping channels	More than 15 non-overlapping channels		PASS
15.247 (a)(1)(iii)	Avg Time of Occupancy	< 8 dBm		PASS
15.207(a)	AC Power Line conducted emissions	Section 11	Power Line conducted	PASS
15.205, 15.209	Radiated Spurious Emission	< 54dBuV/m(Av)	Radiated	PASS

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8. MEASUREMENT METHODS

20dB BW : ANSI C63.10, Section 6.9.2

99% BW : ANSI C63.10, Section 6.9.3

HOPPING FREQUENCY SEPARATION : ANSI C63.10, Section 7.8.2

NUMBER OF HOPPING CHANNELS : ANSI C63.10, Section 7.8.3

AVERAGE TIME OF OCCUPANCY : ANSI C63.10, Section 7.8.4

OUTPUT POWER : ANSI C63.10, Section 7.8.5.

Out-of-band EMISSIONS (Conducted) : ANSI C63.10, Section 7.8.6, 7.8.8

Out-of-band EMISSIONS IN NON-RESTRICTED BANDS: ANSI C63.10, Section 6.

Out-of-band EMISSIONS IN RESTRICTED BANDS : ANSI C63.10, Section 6.

AC Power Line Conducted Emission : ANSI C63.10-2013, Section 6.2.

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9. ANTENNA PORT TEST RESULTS

9.1. ON TIME AND DUTY CYCLE

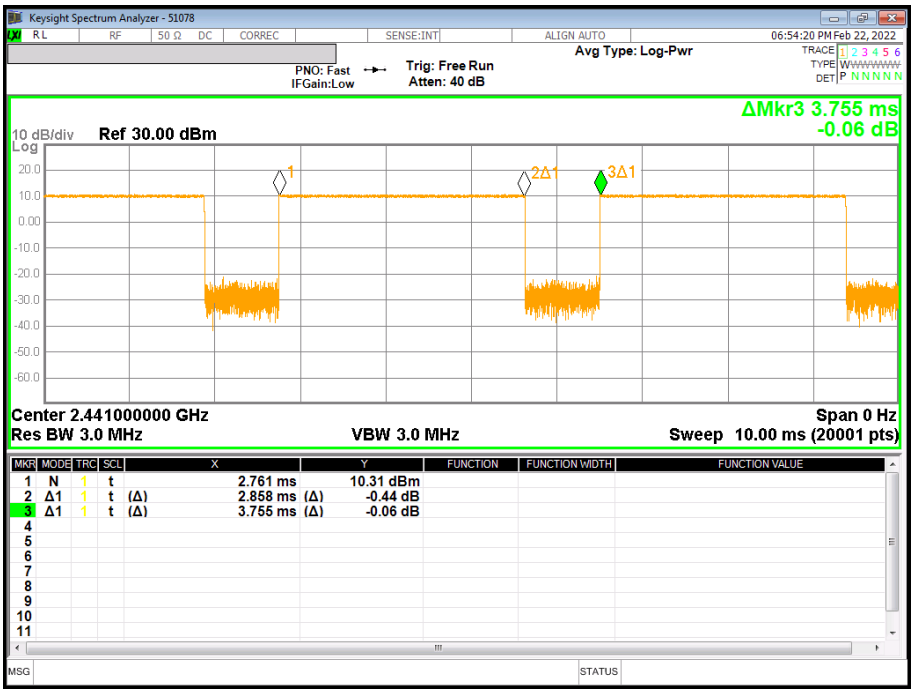
LIMITS

None; for reporting purposes only.

PROCEDURE

ANSI C63.10, Section 11.6 : Zero-Span Spectrum Analyzer Method.

ON TIME AND DUTY CYCLE RESULTS



Mode	On time [msec]	Period [msec]	Duty Cycle [%]	Duty Cycle Correction Factor[dB]	1/T Minimum VBW [kHz]
2 400 ~ 2 483.5 MHz Band					
Bluetooth	2.858	3.755	76.112	1.19	0.350

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9.2. 20 dB BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to ≥ 1% of the 20 dB bandwidth. The VBW is set to ≥ RBW. The sweep time is coupled.

RESULTS

9.2.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	20 dB Bandwidth [kHz]
0	2 402	919.6
39	2 441	864.5
78	2 480	862.8
Worst		**919.6**

9.2.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	20 dB Bandwidth [kHz]
0	2 402	1284.0
39	2 441	1277.0
78	2 480	1277.0
Worst		**1284.0**

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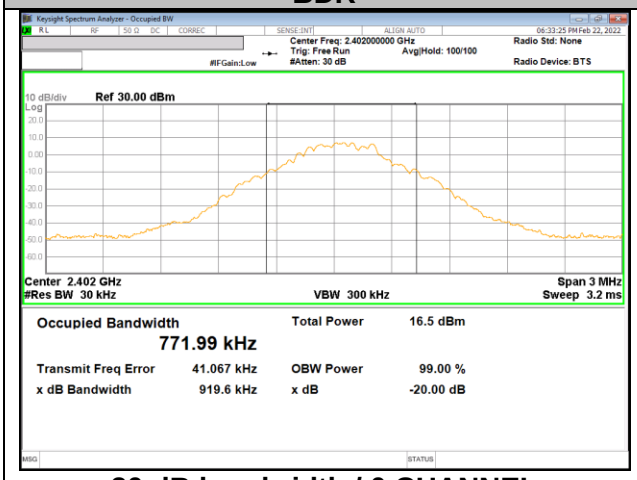
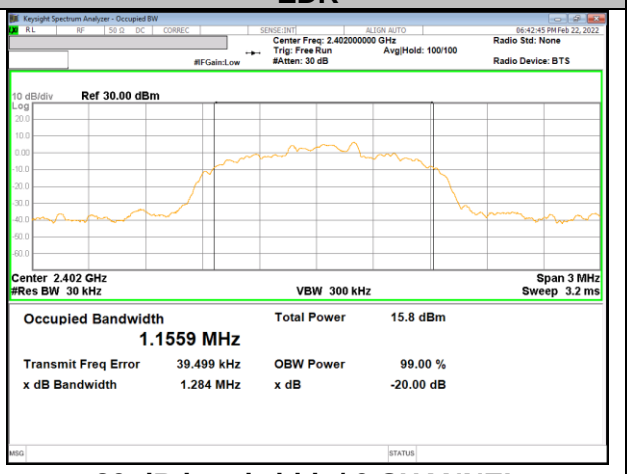
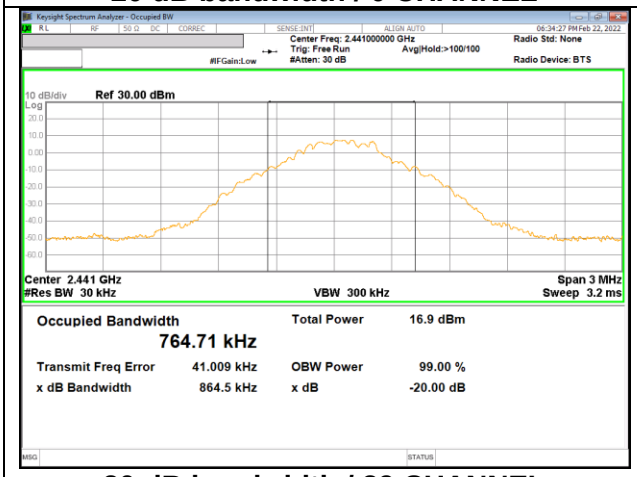
BDR	EDR



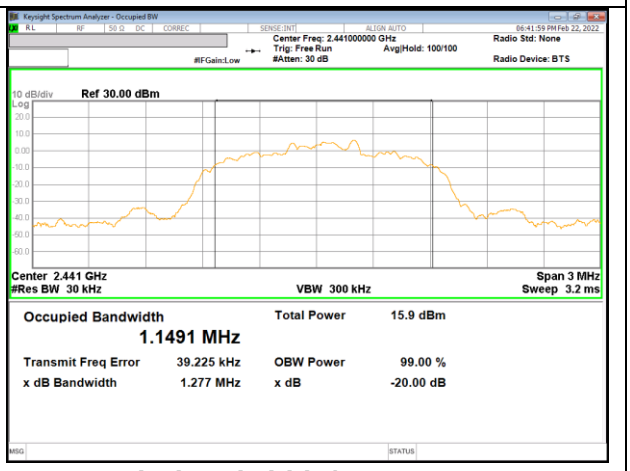
20 dB bandwidth / 0 CHANNEL



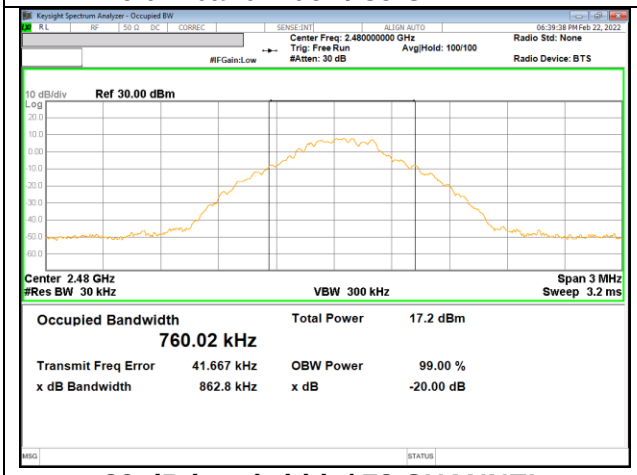
20 dB bandwidth / 0 CHANNEL



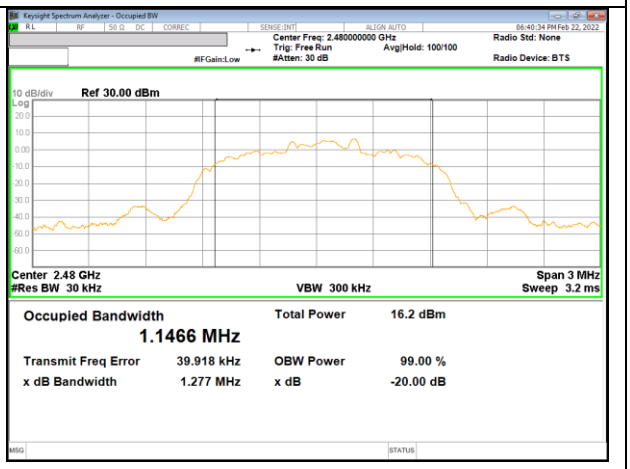
20 dB bandwidth / 39 CHANNEL



20 dB bandwidth / 39 CHANNEL



20 dB bandwidth / 78 CHANNEL



20 dB bandwidth / 78 CHANNEL

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9.3. HOPPING FREQUENCY SEPARATION

LIMITS

FCC §15.247 (a) (1)

RSS-247 (5.1) (b)

Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hoping channel, whichever is greater.

Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The RBW is set to 300 kHz and the VBW is set to VBW >= RBW. The sweep time is coupled.

RESULTS

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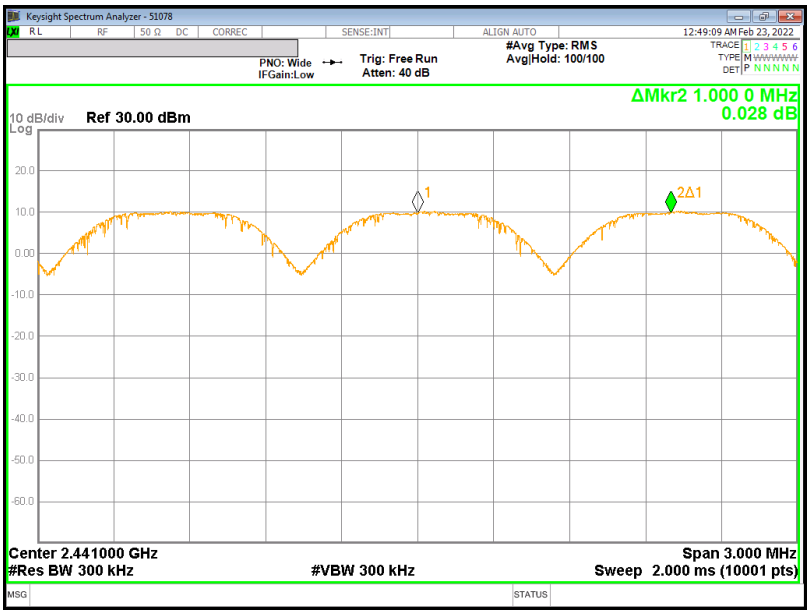
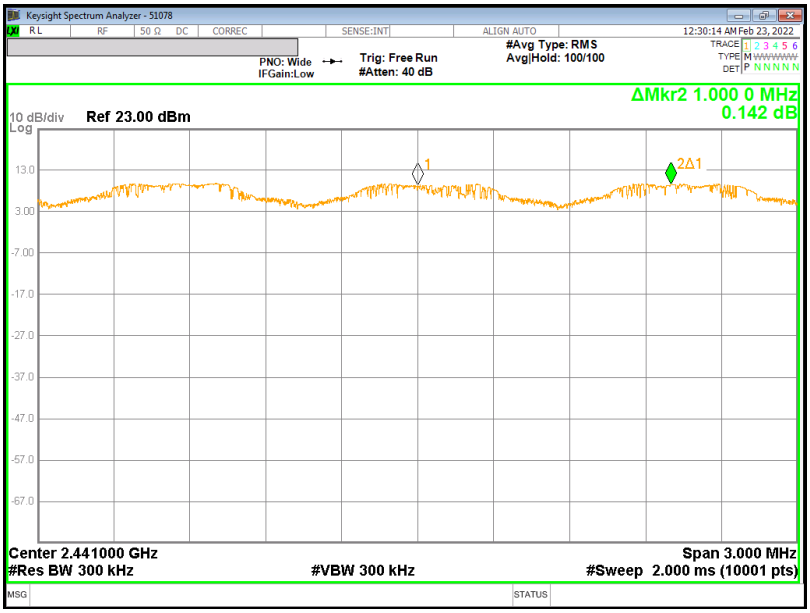
9.3.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



9.3.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



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9.4. NUMBER OF HOPPING CHANNELS

LIMITS

FCC §15.247 (a) (1) (iii)

RSS-247 (5.1) (d)

Frequency hopping systems in the 2400 – 2483.5 MHz band shall use at least 15 non-overlapping channels.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to cover the entire authorized band, in either a single sweep or in multiple contiguous sweeps. The RBW is set to a maximum of 1 % of the span. The analyzer is set to Max Hold.

RESULTS

Normal Mode: All Channels Observed

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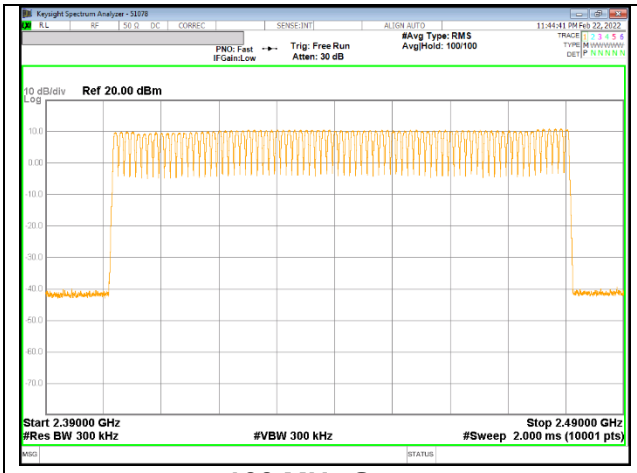
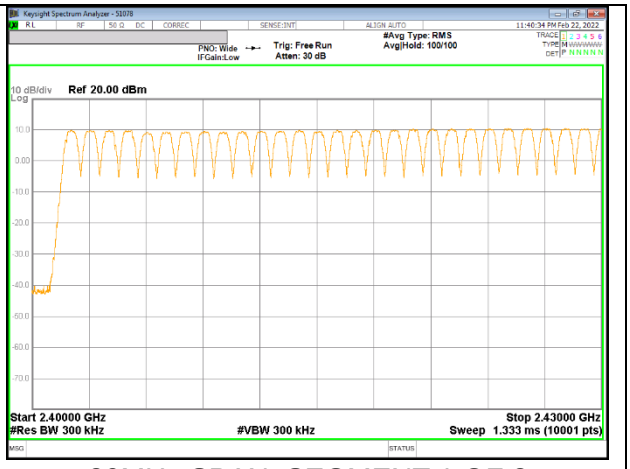
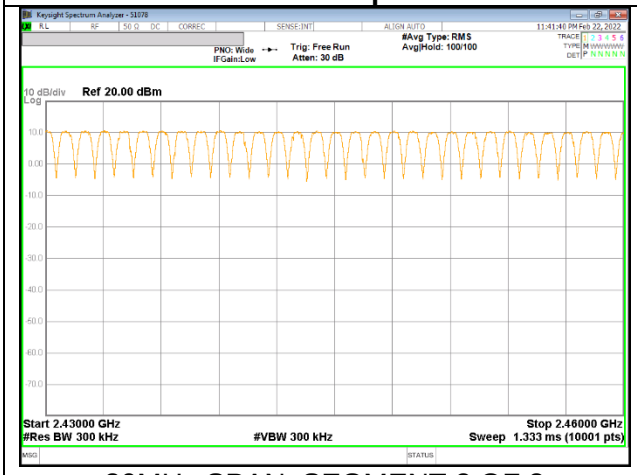
9.4.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION



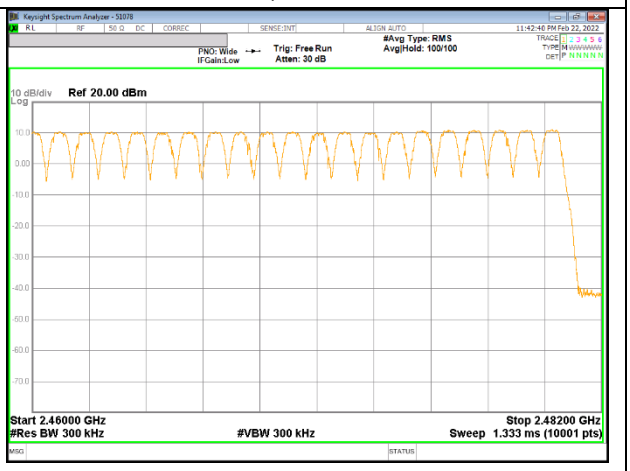
100 MHz Span



30MHz SPAN, SEGMENT 1 OF 3



30MHz SPAN, SEGMENT 2 OF 3



30MHz SPAN, SEGMENT 3 OF 3

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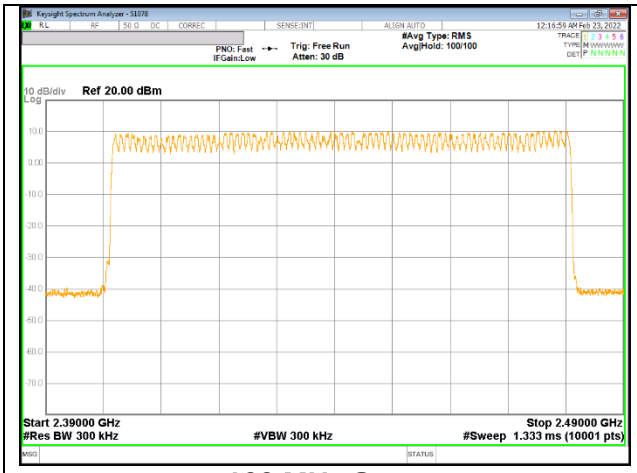
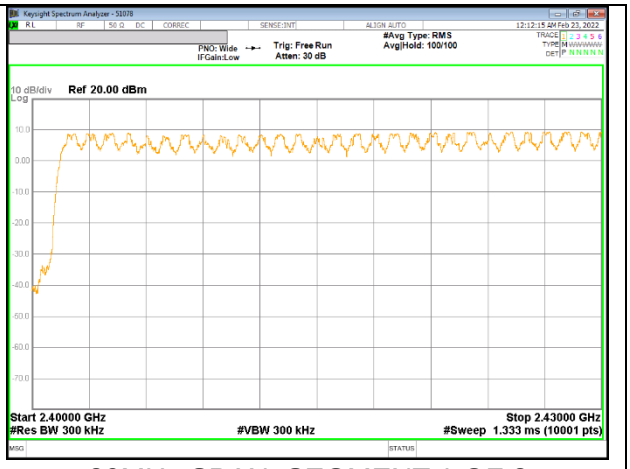
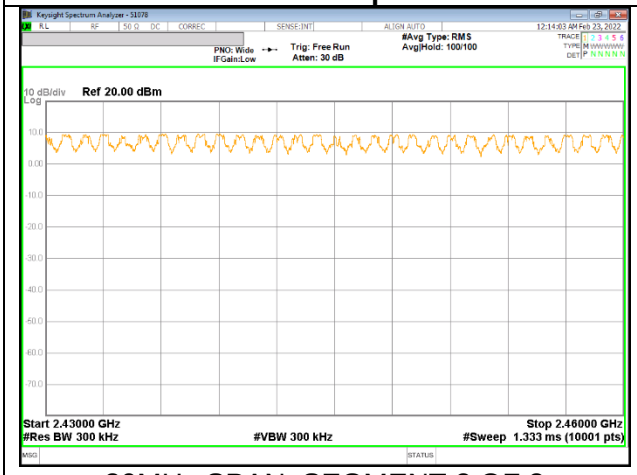
9.4.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION



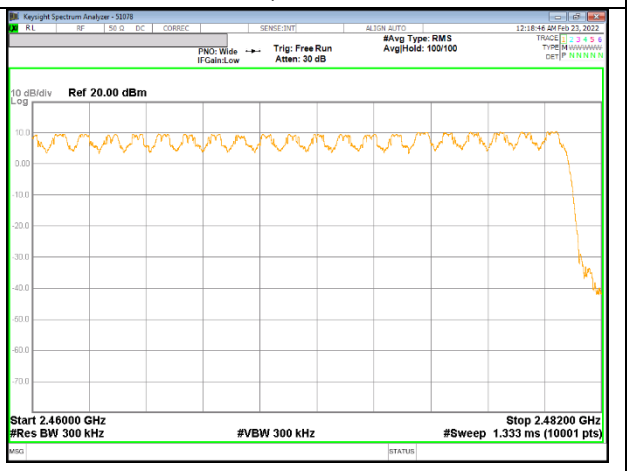
100 MHz Span



30MHz SPAN, SEGMENT 1 OF 3



30MHz SPAN, SEGMENT 2 OF 3



30MHz SPAN, SEGMENT 3 OF 3

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9.5. AVERAGE TIME OF OCCUPANCY

LIMITS

FCC §15.247 (a) (1) (iii)

RSS-247 (5.1) (d)

The average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The span is set to 0 Hz, centered on a single, selected hopping channel. The width of a single pulse is measured in a fast scan. The number of pulses is measured in a 3.16 second scan, to enable resolution of each occurrence.

The average time of occupancy in the specified 3.16 second period (79 channels * 0.4 s) is equal to 10 * (# of pulses in 3.16 s) * pulse width.

For AFH mode, the average time of occupancy in the specified 8 second period (20 channels * 0.4 seconds) is equal to 10 * (# of pulses in 0.8 s) * pulse width.

RESULTS

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9.5.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
GFSK ANT1 Normal					
DH1	0.371	32	0.119	0.4	-0.281
DH3	1.622	16	0.260	0.4	-0.140
DH5	2.874	12	0.345	0.4	-0.055
DH Packet	**Pulse Width [msec]**	**Number of Pulses in 0.8 seconds**	**Average Time of Occupancy [sec]**	**Limit [sec]**	**Margin [sec]**
GFSK ANT1 AFH					
DH1	0.371	8	0.030	0.4	-0.370
DH3	1.622	4	0.065	0.4	-0.335
DH5	2.874	3	0.086	0.4	-0.314

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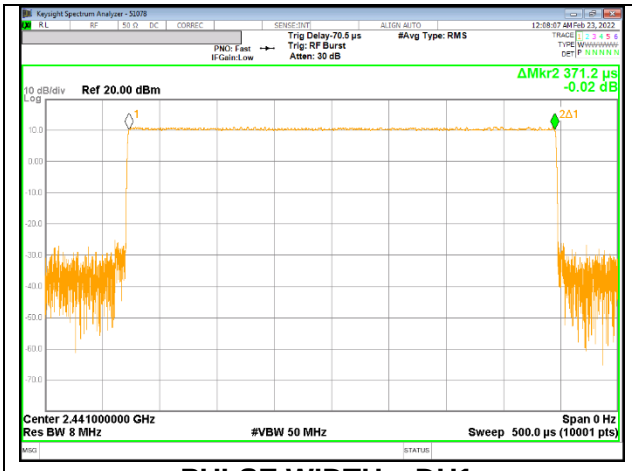
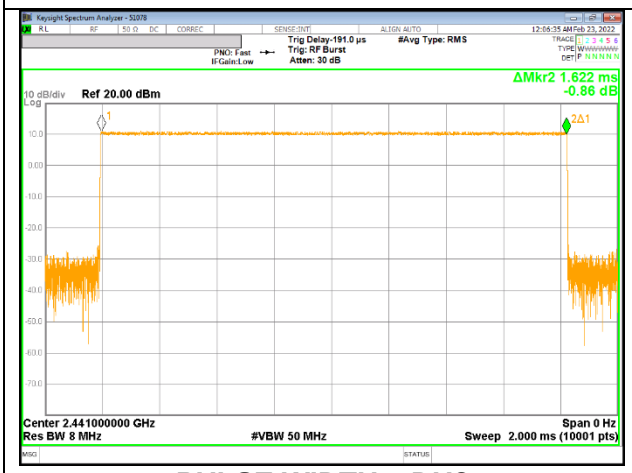


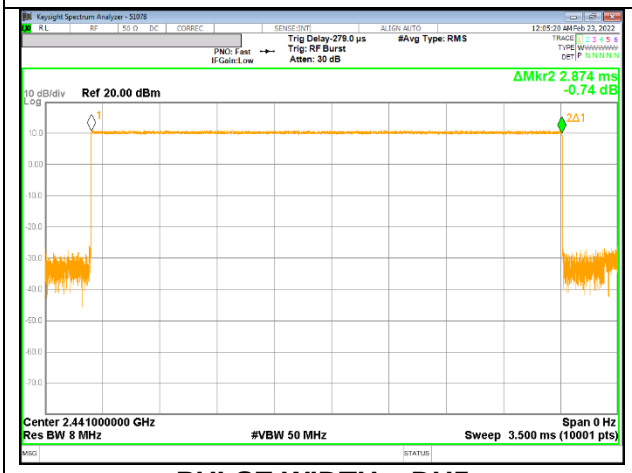
PULSE WIDTH – DH1

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH1



PULSE WIDTH – DH3

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH3



PULSE WIDTH – DH5

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – DH5

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9.5.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

DH Packet	Pulse Width [msec]	Number of Pulses in 3.16 seconds	Average Time of Occupancy [sec]	Limit [sec]	Margin [sec]
8PSK ANT1 Normal					
DH1	0.381	32	0.122	0.4	-0.278
DH3	1.632	17	0.277	0.4	-0.123
DH5	2.881	12	0.346	0.4	-0.054
DH Packet	**Pulse Width [msec]**	**Number of Pulses in 0.8 seconds**	**Average Time of Occupancy [sec]**	**Limit [sec]**	**Margin [sec]**
8PSK ANT1 AFH					
DH1	0.381	8	0.030	0.4	-0.370
DH3	1.632	4	0.069	0.4	-0.331
DH5	2.881	3	0.086	0.4	-0.314

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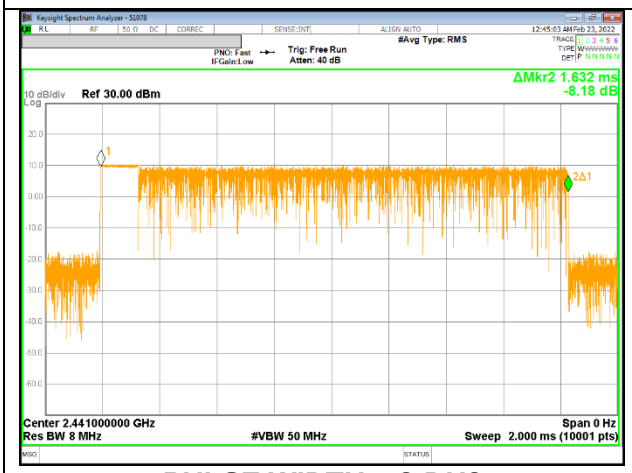
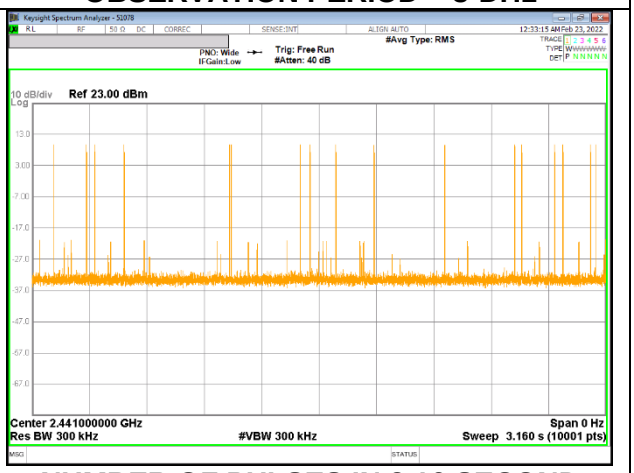
PULSE WIDTH – 3-DH1

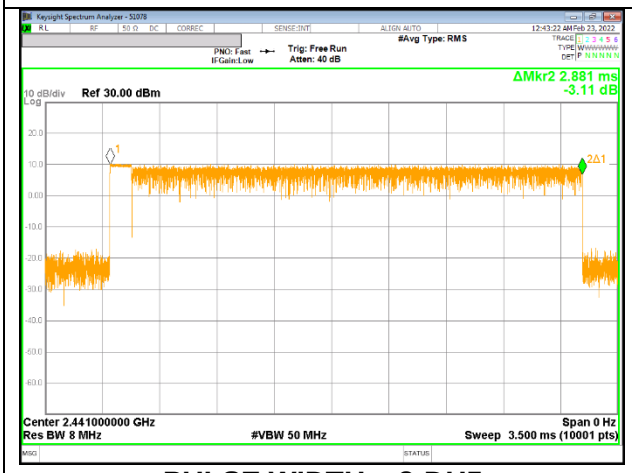
NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3-DH1



PULSE WIDTH – 3-DH3



NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3-DH3



PULSE WIDTH – 3-DH5

NUMBER OF PULSES IN 3.16 SECOND OBSERVATION PERIOD – 3-DH5

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9.6. OUTPUT POWER

LIMITS

§15.247 (b) (1)
The maximum antenna gain is less than 6 dBi, therefore the limit is 21 dBm.

TEST PROCEDURE
The transmitter output is connected to a spectrum analyzer the analyzer bandwidth is set to a value greater than the 20 dB bandwidth of the EUT.

RESULTS

9.6.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
0	2 402	10.531	21.000	-10.469
39	2 441	10.872		-10.128
78	2 480	10.986		-10.014
Worst		**10.986**		**-10.014**

9.6.2. ENHANCED DATA RATE Pi/4-DPSK MODULATION

Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
0	2 402	9.887	21.000	-11.113
39	2 441	10.171		-10.829
78	2 480	10.278		-10.722
Worst		**10.278**		**-10.722**

9.6.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	Peak Output Power [dBm]	Limit [dBm]	Margin [dB]
0	2 402	9.923	21.000	-11.077
39	2 441	10.180		-10.820
78	2 480	10.289		-10.711
Worst		**10.289**		**-10.711**

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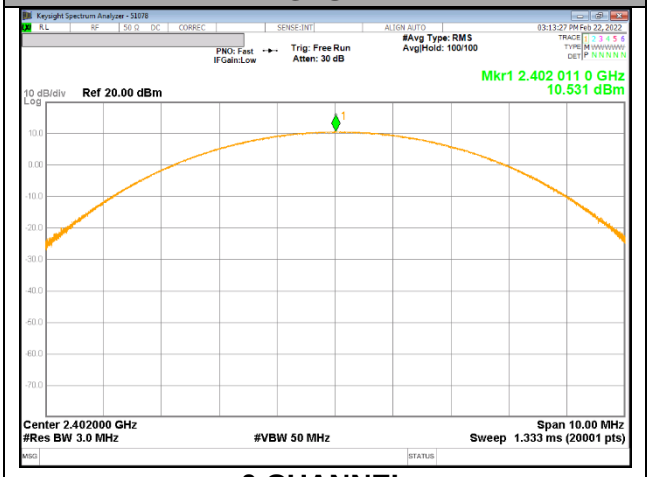
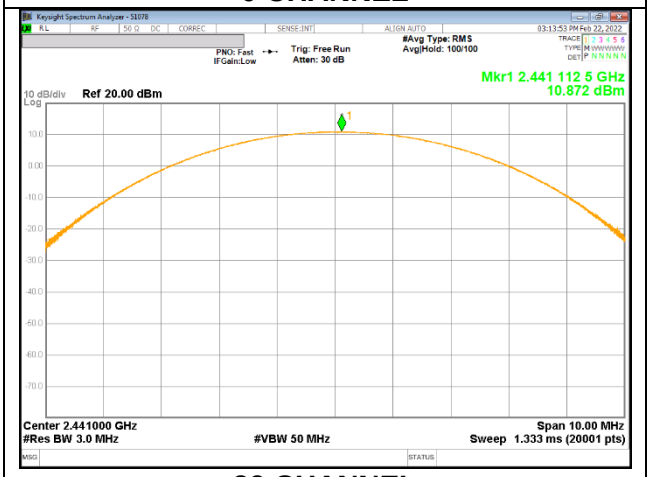
9.6.4. OUTPUT POWER PLOTS

PEAK OUTPUT POWER

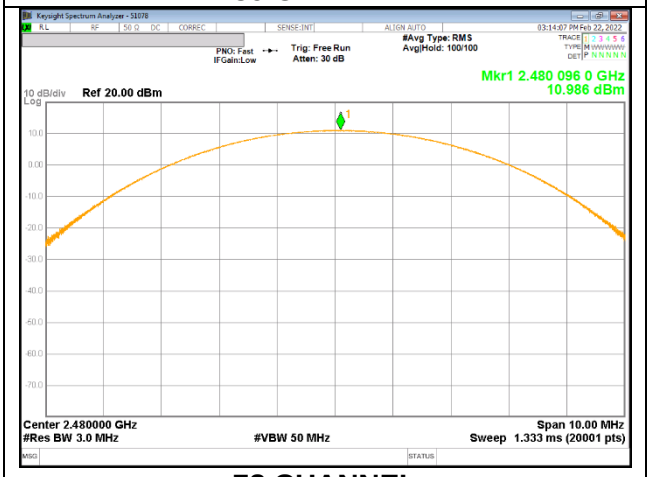
GFSK



0 CHANNEL



39 CHANNEL



78 CHANNEL

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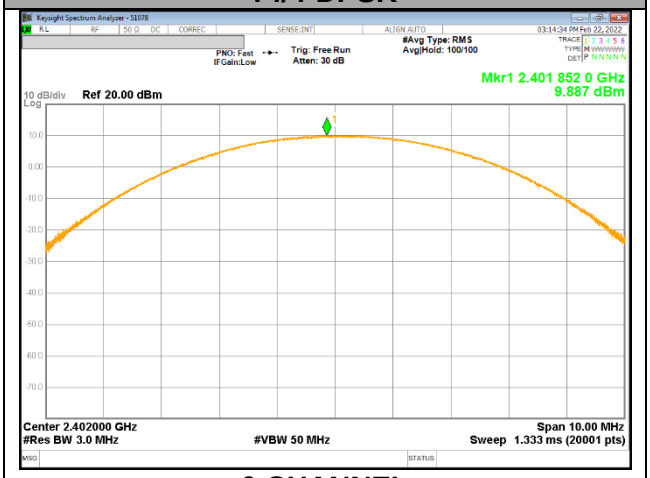
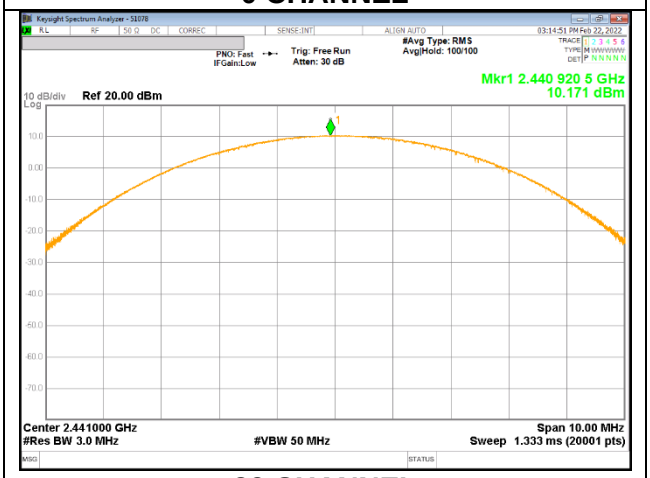
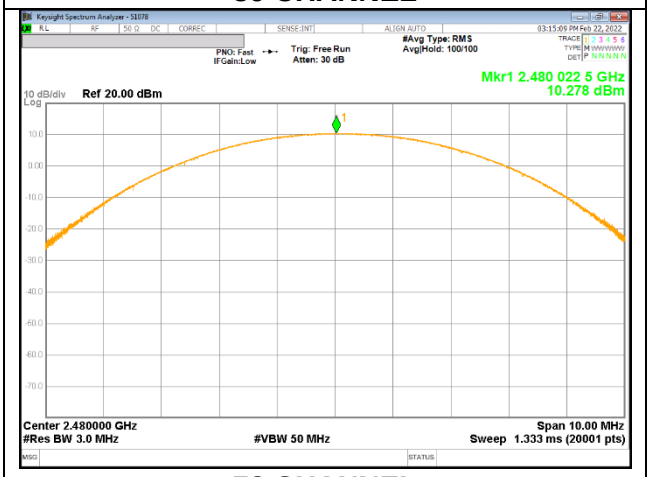
Pi/4-DPSK



0 CHANNEL



39 CHANNEL



78 CHANNEL

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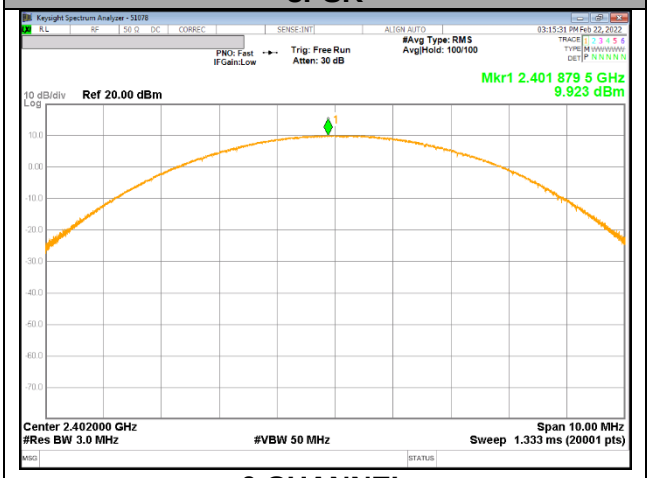
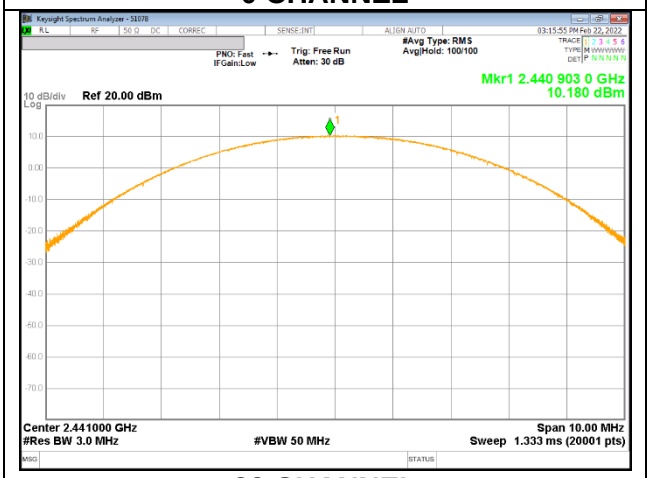
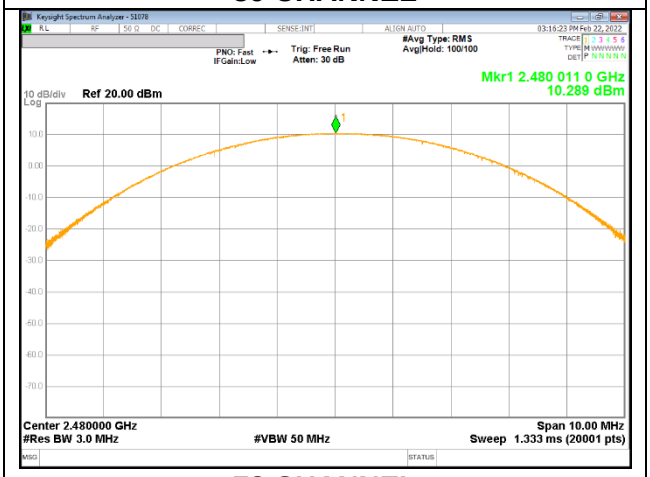
8PSK



0 CHANNEL



39 CHANNEL



78 CHANNEL

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9.7. AVERAGE POWER

LIMITS

None; for reporting purposes only

TEST PROCEDURE

Measurements perform using a wideband gated RF power meter.
The cable assembly insertion loss was entered as an offset in the power meter to allow for direct reading of power.

RESULTS

9.7.1. BASIC DATA RATE GFSK MODULATION

Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
0	2 402	9.692	9.315
39	2 441	10.147	10.344
78	2 480	10.307	10.732

9.7.2. ENHANCED DATA RATE PI/4-DQPSK MODULATION

Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
0	2 402	7.720	5.916
39	2 441	8.048	6.379
78	2 480	8.142	6.519

9.7.3. ENHANCED DATA RATE 8PSK MODULATION

Channel	Frequency [MHz]	Average Output Power [dBm]	Average Output Power [mW]
0	2 402	7.181	5.225
39	2 441	8.069	6.410
78	2 480	8.161	6.548

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9.8. CONDUCTED SPURIOUS EMISSIONS

LIMITS

FCC §15.247 (d)

Limit = -20 dBc

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels.

The band-edges at 2.4 and 2.4835 GHz are investigated with the transmitter set to the normal hopping mode.

RESULTS

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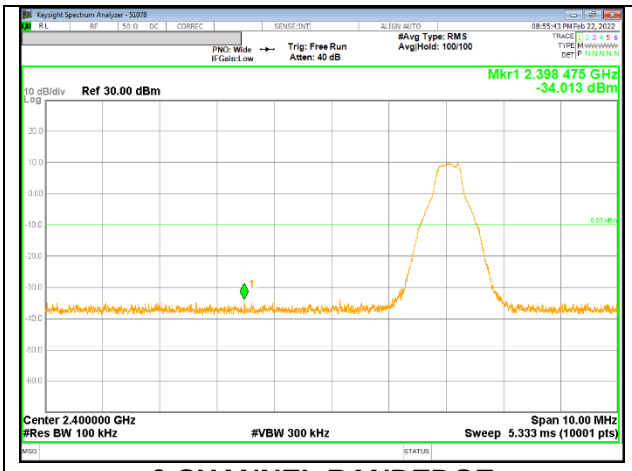
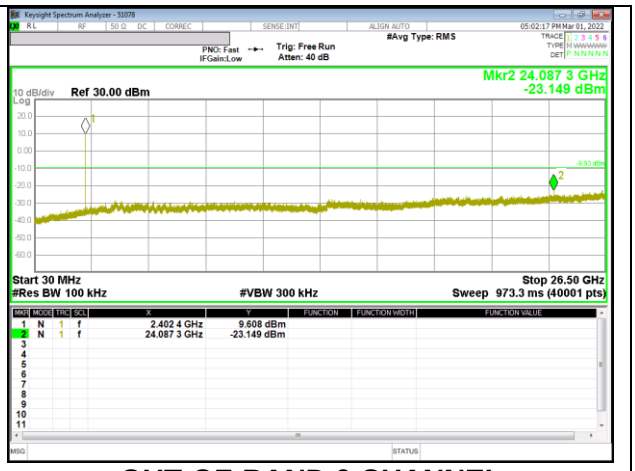
9.8.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

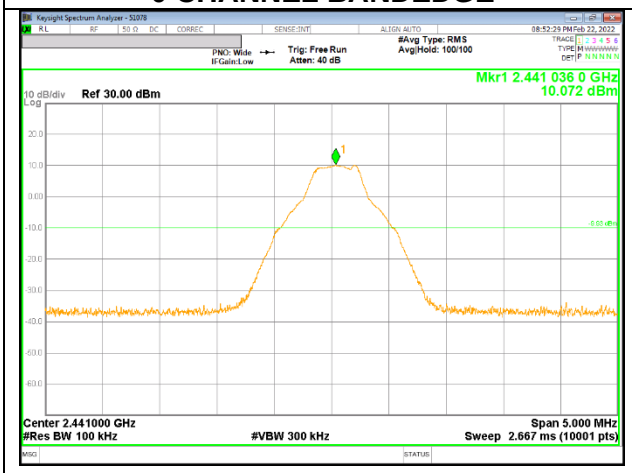
SPURIOUS EMISSIONS, NON-HOPPING



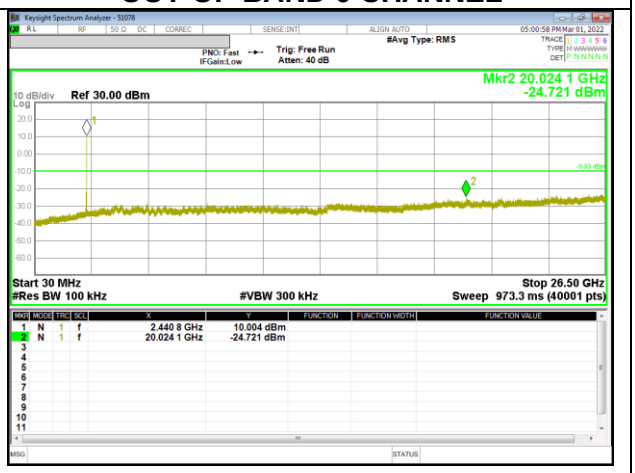
0 CHANNEL BANDEDGE



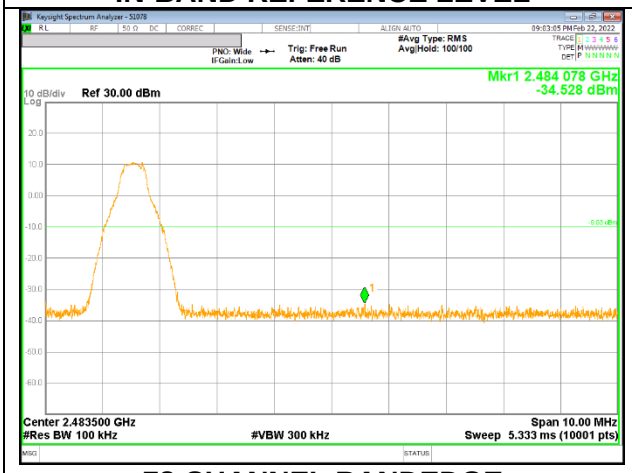
OUT-OF-BAND 0 CHANNEL



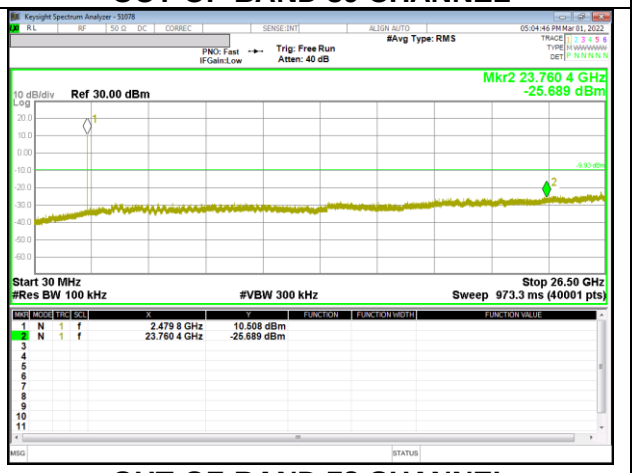
IN-BAND REFERENCE LEVEL



OUT-OF-BAND 39 CHANNEL



78 CHANNEL BANDEDGE



OUT-OF-BAND 78 CHANNEL

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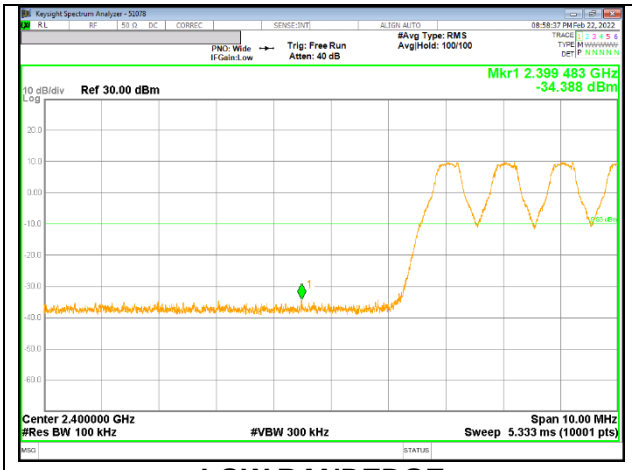
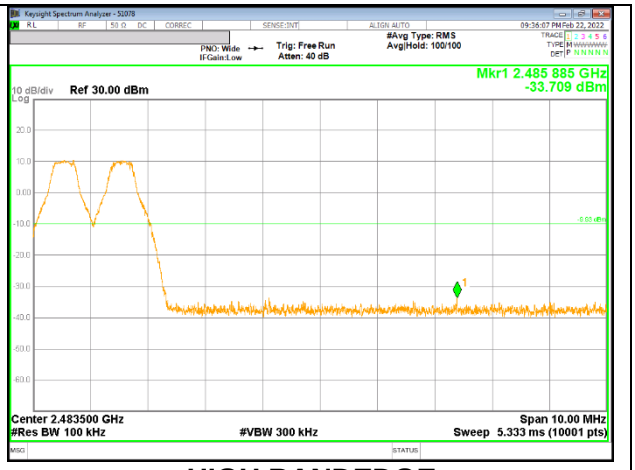
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



LOW BANDEDGE



HIGH BANDEDGE

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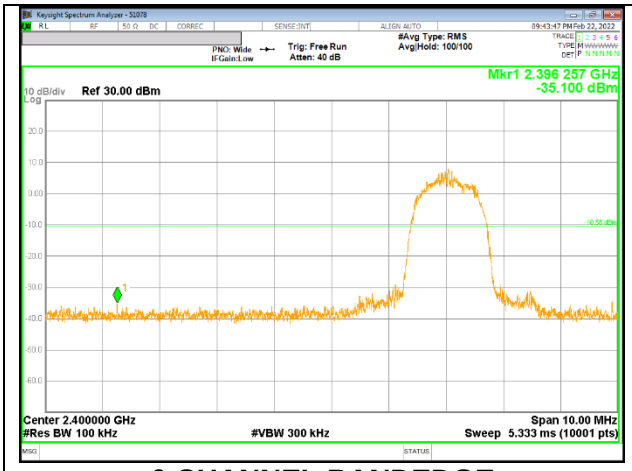
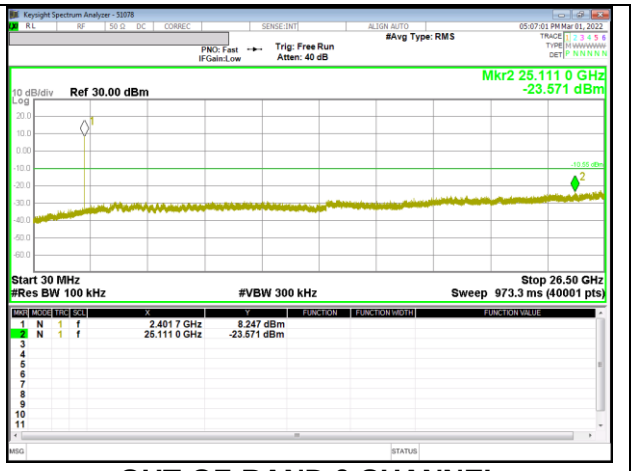
9.8.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

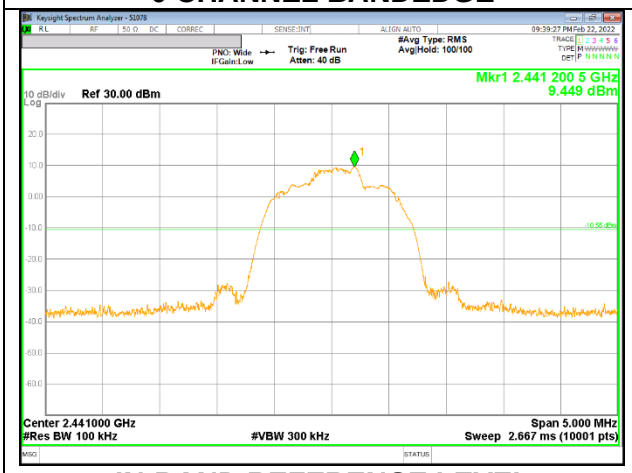
SPURIOUS EMISSIONS, NON-HOPPING



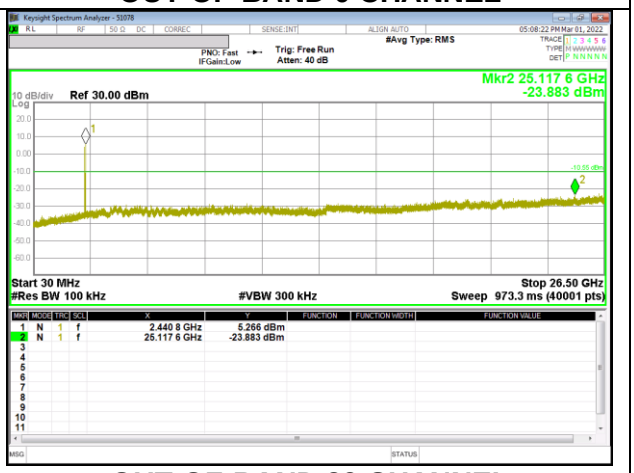
0 CHANNEL BANDEDGE



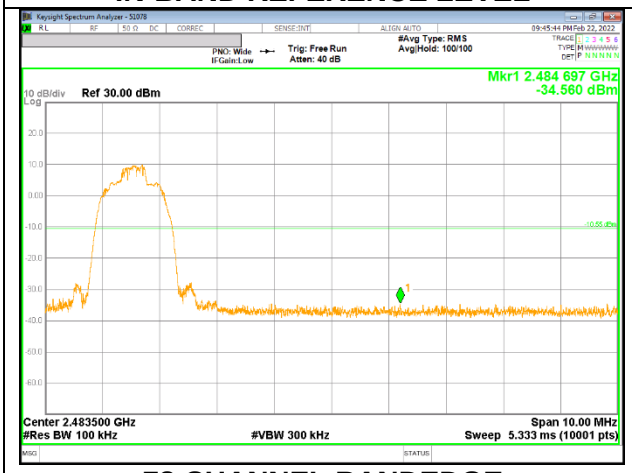
OUT-OF-BAND 0 CHANNEL



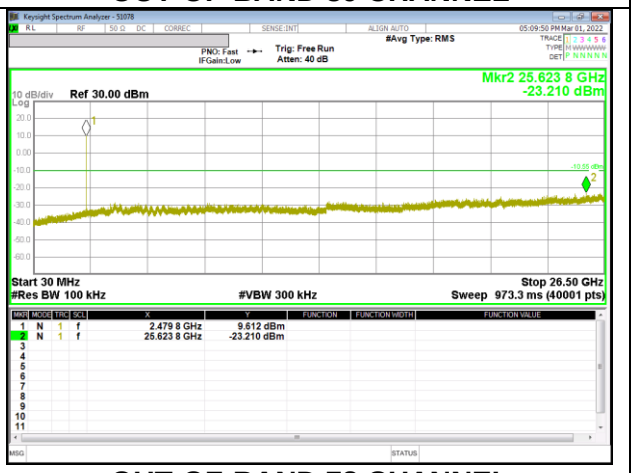
IN-BAND REFERENCE LEVEL



OUT-OF-BAND 39 CHANNEL



78 CHANNEL BANDEDGE



OUT-OF-BAND 78 CHANNEL

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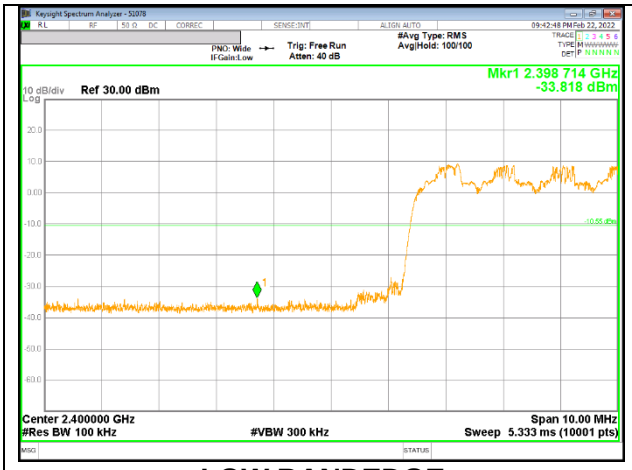
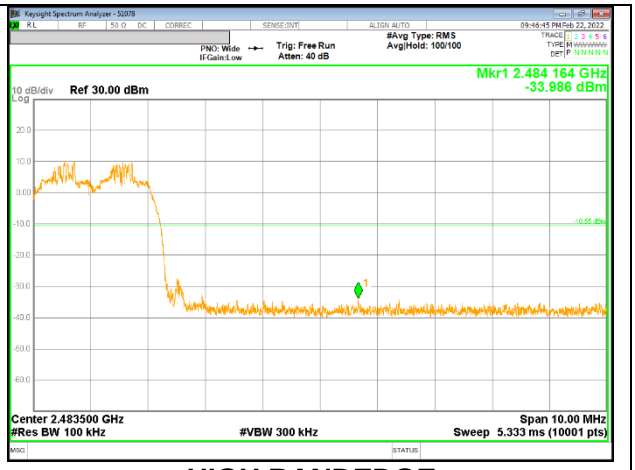
SPURIOUS BANDEDGE EMISSIONS WITH HOPPING ON



LOW BANDEDGE



HIGH BANDEDGE

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10. RADIATED TEST RESULTS

LIMITS

FCC §15.205 and §15.209

Limits for radiated disturbance of an intentional radiator		
Frequency range (MHz)	Limits (µV/m)	Measurement Distance (m)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 – 88	100**	3
88 - 216	150**	3
216 – 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.

FCC Part 15.205 (a) : Only spurious emissions are permitted in any of the frequency bands listed below :

MHz	MHz	MHz	MHz	GHz	GHz
0.009 ~ 0.110	8.41425 ~ 8.41475	108 ~ 121.94	1300 ~ 1427	4.5 ~ 5.15	14.47 ~ 14.5
0.495 ~ 0.505	12.29 ~ 12.293	123 ~ 138	1435 ~ 1626.5	5.35 ~ 5.46	15.35 ~ 16.2
2.1735 ~ 2.1905	12.51975 ~ 12.52025	149.9 ~ 150.05	1645.5 ~ 1646.5	7.25 ~ 7.75	17.7 ~ 21.4
4.125 ~ 4.128	12.57675 ~ 12.57725	156.52475 ~	1660 ~ 1710	8.025 ~ 8.5	22.01 ~ 23.12
4.17725 ~ 4.17775	13.36 ~ 13.41	156.52525	1718.8 ~ 1722.2	9.0 ~ 9.2	23.6 ~ 24.0
4.20725 ~ 4.20775	16.42 ~ 16.423	156.7 ~ 156.9	2200 ~ 2300	9.3 ~ 9.5	31.2 ~ 31.8
6.215 ~ 6.218	16.69475 ~ 16.69525	162.0125 ~	2310 ~ 2390	10.6 ~ 12.7	36.43 ~ 36.5
6.26775 ~ 6.26825	16.80425 ~ 16.80475	167.17	2483.5 ~ 2500	13.25 ~ 13.4	Above 38.6
6.31175 ~ 6.31225	25.5 ~ 25.67	167.72 ~ 173.2	2655 ~ 2900		
8.291 ~ 8.294	37.5 ~ 38.25	240 ~ 285	3260 ~ 3267		
8.362 ~ 8.366	73 ~ 74.6	322 ~ 335.4	3332 ~ 3339		
8.37625 ~ 8.38675	74.8 ~ 75.2	399.90 ~ 410	3345.8 ~ 3358		
		608 ~ 614	3600 ~ 4400		
		960 ~ 1240			

▪ FCC Part 15.205(b) : The field strength of emissions appearing within these frequency bands shall not exceed the limits shown in §15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in §15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in §15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in §15.35 apply to these measurements.

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TEST PROCEDURE

The EUT is placed on a non-conducting table 80 cm above the ground plane for below 1GHz and 150 cm for above 1GHz. The EUT is configured in accordance with ANSI C63.10. The EUT is set to transmit in a continuous mode.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 3 MHz for peak measurements.(Pre-scans to detect harmonic and spurious emissions, the resolution bandwidth is set to 1 MHz; the video bandwidth is set to 30 kHz for peak measurements.)

For band edge measurements above 1 GHz the resolution bandwidth is set to 1 MHz, then the video bandwidth is set to 3 MHz for peak measurements and 1/T (on time) for average measurement.

GFSK = 1/T = 1 / 0.00288s = 347Hz.

The minimum VBW was 347Hz, but test receiver(ESU40) couldn't set value 347Hz. Due to this reason, testing VBW was set to 500Hz(Worst cases).

The spectrum from 1GHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.
(From 30MHz to 1GHz, test was performed with the EUT set to transmit at the channel with highest output power)

The frequency range of interest is monitored at a fixed antenna height and EUT azimuth. The EUT is rotated through 360 degrees to maximize emissions received. The antenna is scanned from 1 to 4 meters above the ground plane to further maximize the emission. Measurements are made with the antenna polarized in both the vertical and the horizontal positions.

Note : Emission was pre-scanned from 9kHz to 30MHz; No emissions were detected which was at least 20dB below the specification limit (consider distance correction factor).
Per FCC part 15.31(o), test results were not reported.

Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 30 m open are test site.
Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the one of tests made in an open field based on KDB 414788.

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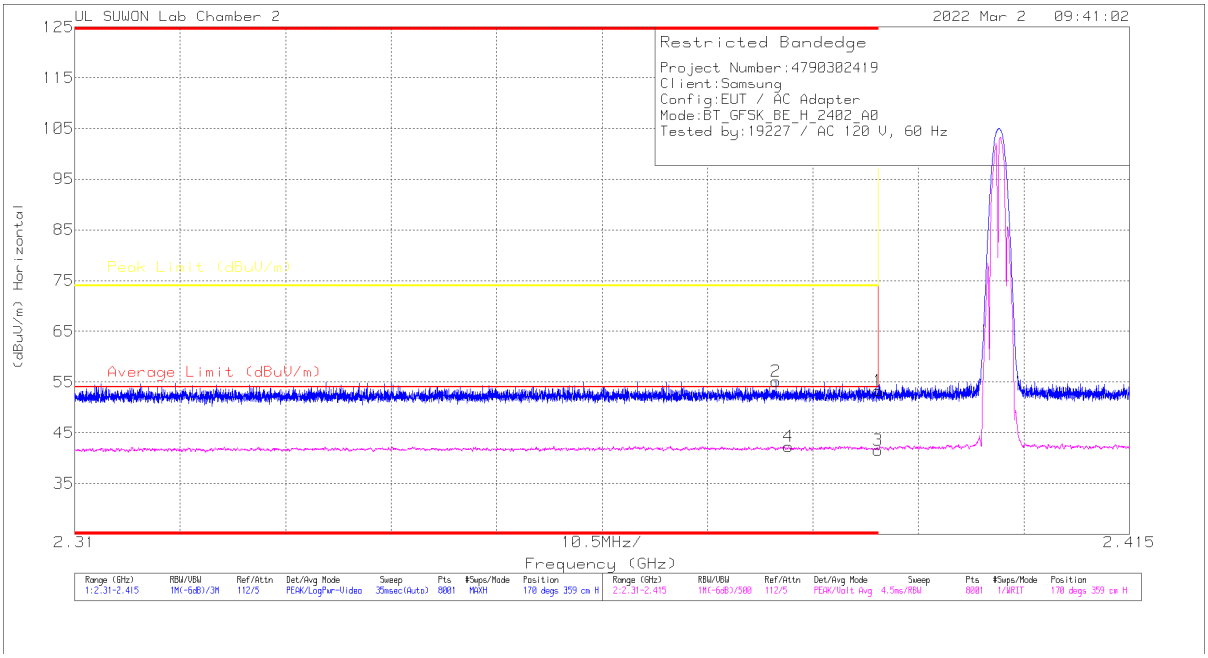
10.1. TRANSMITTER ABOVE 1 GHz

10.1.1. BLUETOOTH BASIC DATA RATE GFSK MODULATION

BANDEDGE (0 CHANNEL)

HORIZONTAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	42.04	Pk	31.9	-20.6	53.34	-	-	74	-20.66	170	359	H
2	* 2.3798	43.88	Pk	31.9	-20.6	55.18	-	-	74	-18.82	170	359	H
3	* 2.39	30.28	VA1T	31.9	-20.6	41.58	54	-12.42	-	-	170	359	H
4	* 2.38106	30.93	VA1T	31.9	-20.5	42.33	54	-11.67	-	-	170	359	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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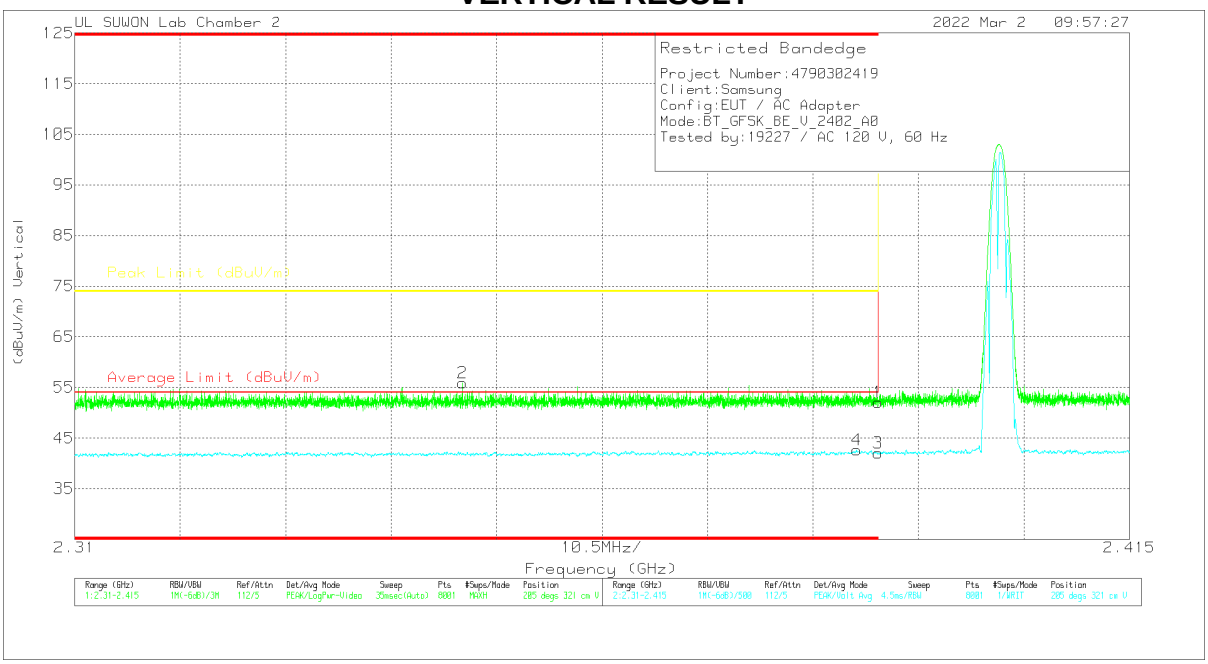
VERTICAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	40.8	Pk	31.9	-20.6	52.1	-	-	74	-21.9	205	321	V
2	* 2.34859	44.65	Pk	31.8	-20.6	55.85	-	-	74	-18.15	205	321	V
3	* 2.39	30.78	VA1T	31.9	-20.6	42.08	54	-11.92	-	-	205	321	V
4	* 2.38784	31.36	VA1T	31.9	-20.6	42.66	54	-11.34	-	-	205	321	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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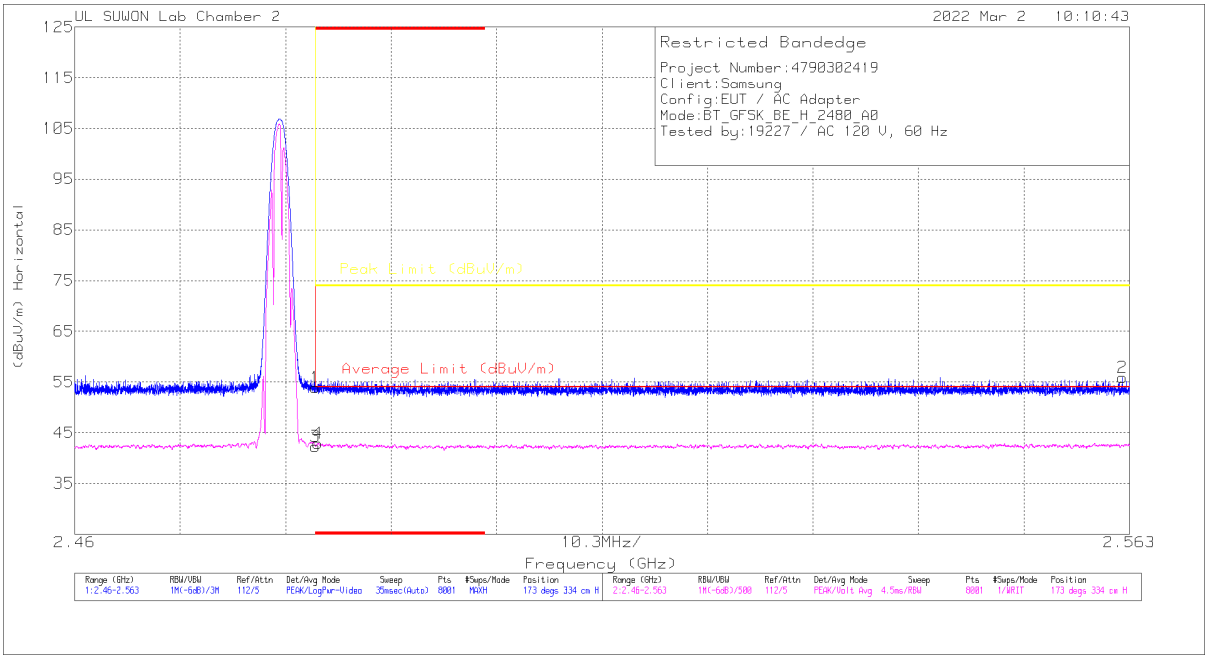
BANDEDGE (78 CHANNEL)

HORIZONTAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	42.28	Pk	32	-20.4	53.88	-	-	74	-20.12	173	334	H
2	2.5623	44.03	Pk	32.2	-20.3	55.93	-	-	74	-18.07	173	334	H
3	* 2.48351	30.73	VA1T	32	-20.4	42.33	54	-11.67	-	-	173	334	H
4	* 2.48377	31.29	VA1T	32	-20.4	42.89	54	-11.11	-	-	173	334	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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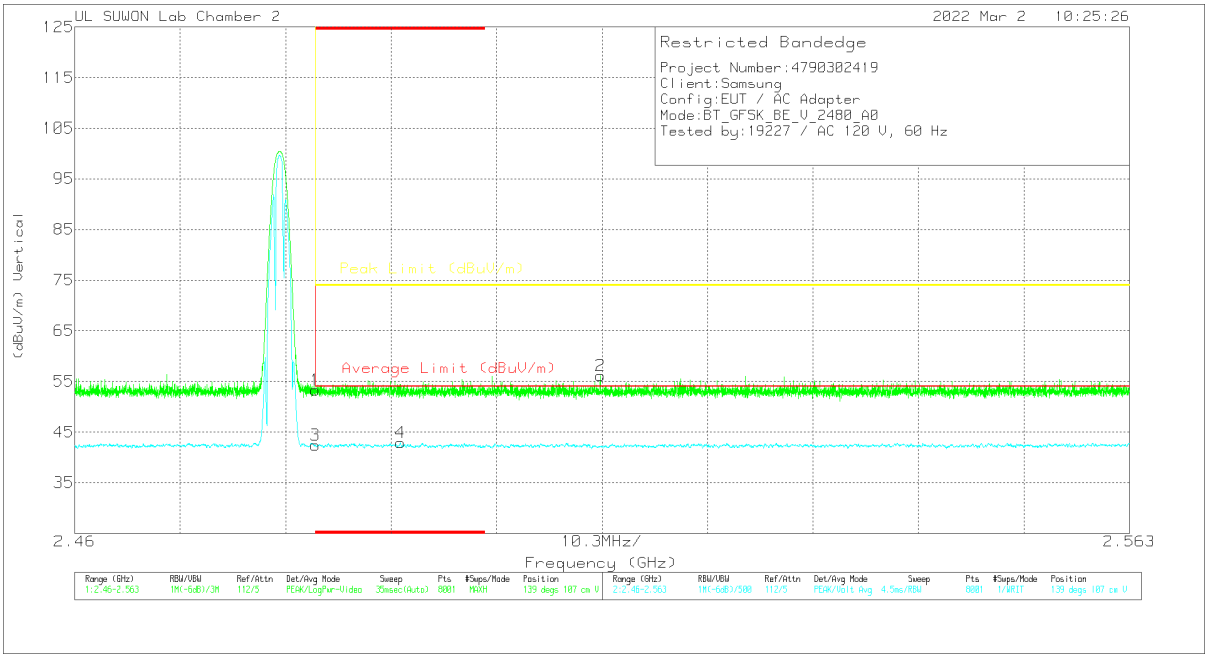
VERTICAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	41.66	Pk	32	-20.4	53.26	-	-	74	-20.74	139	107	V
2	2.51132	44.45	Pk	32.1	-20.4	56.15	-	-	74	-17.85	139	107	V
3	* 2.48351	30.77	VA1T	32	-20.4	42.37	54	-11.63	-	-	139	107	V
4	* 2.49181	31.15	VA1T	32.1	-20.4	42.85	54	-11.15	-	-	139	107	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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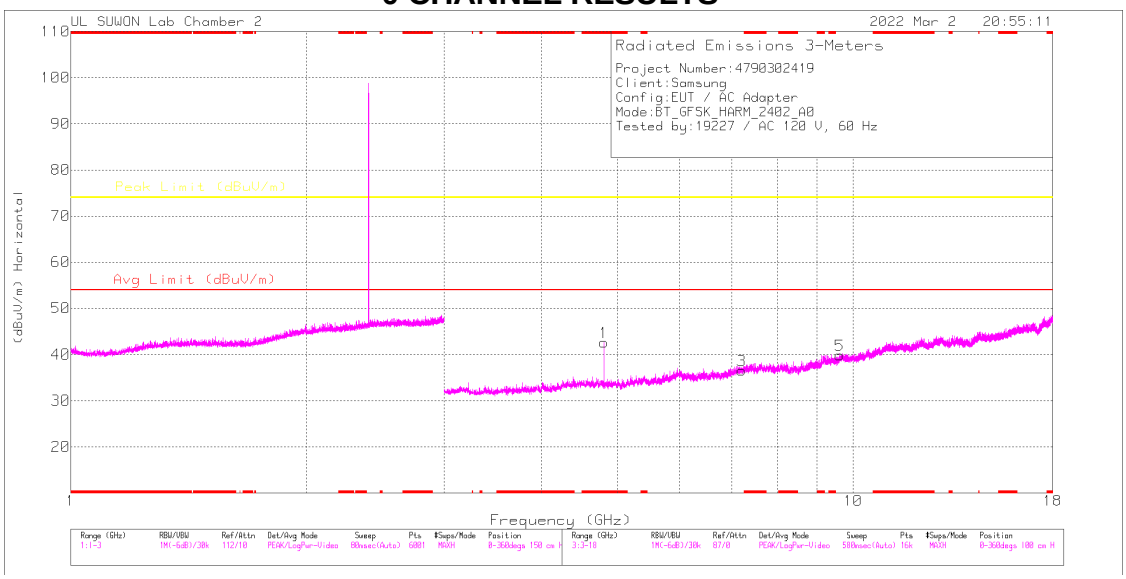
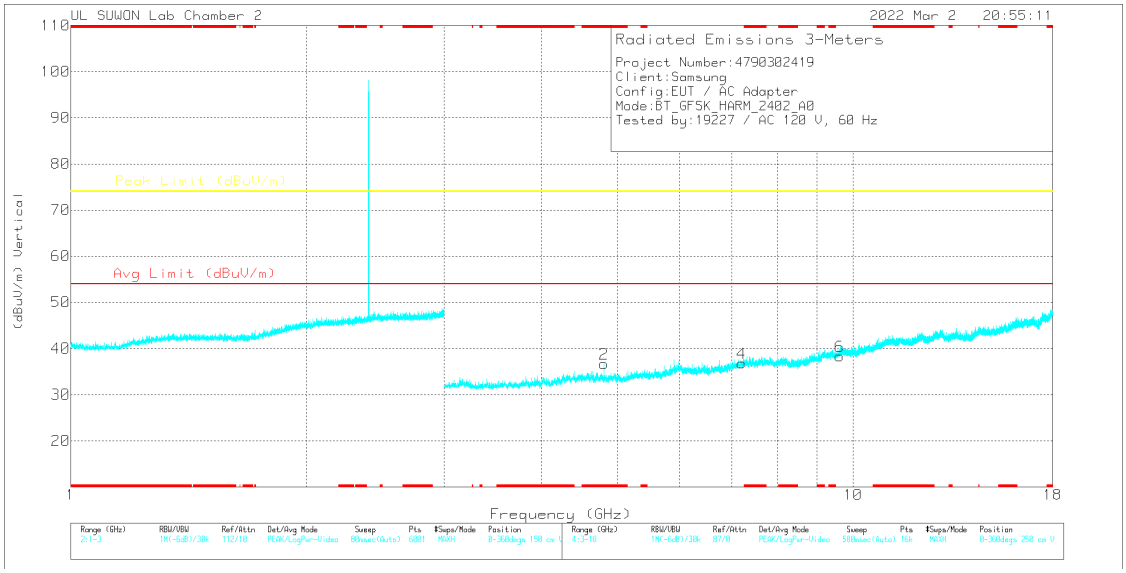
HARMONICS AND SPURIOUS EMISSIONS

0 CHANNEL RESULTS



HORIZONTAL



VERTICAL

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.80442	41.65	PKFH	34.1	-28	47.75	-	-	74	-26.25	317	100	H
* 4.8041	37.17	VA1T	34.1	-28	43.27	54	-10.73	-	-	317	100	H
* 4.80449	35.9	PKFH	34.1	-28	42	-	-	74	-32	116	102	V
* 4.80409	27.64	VA1T	34.1	-28	33.74	54	-20.26	-	-	116	102	V
7.2043	33.2	PKFH	36.2	-25.3	44.1	-	-	74	-29.9	360	100	H
7.20606	34.3	PKFH	36.2	-25.3	45.2	-	-	74	-28.8	0	100	V
9.60556	30.86	PKFH	37	-21.7	46.16	-	-	74	-27.84	360	100	H
9.61112	32.21	PKFH	37	-21.7	47.51	-	-	74	-26.49	0	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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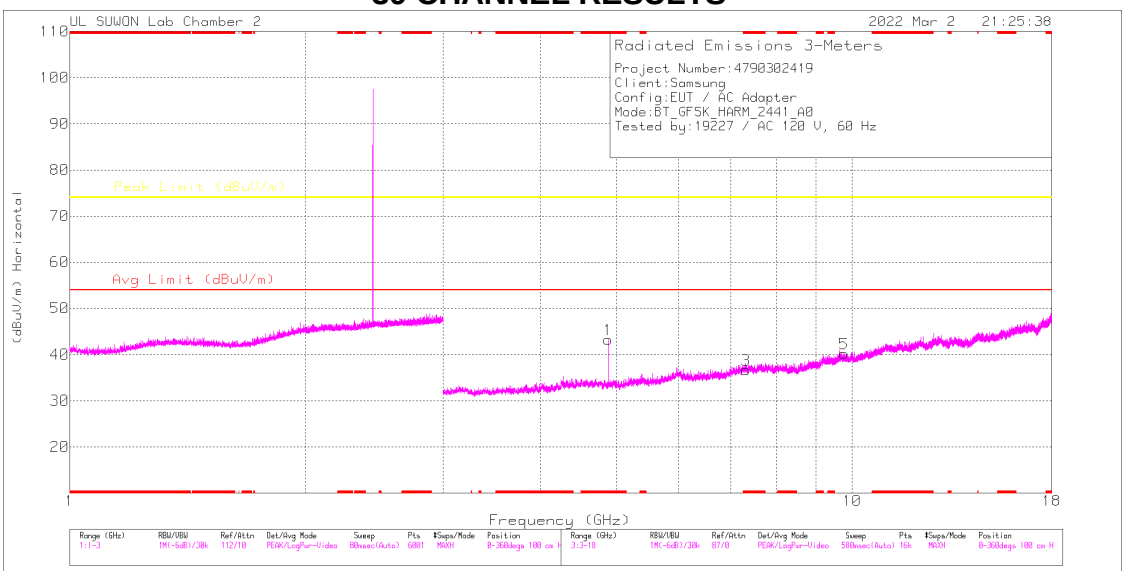
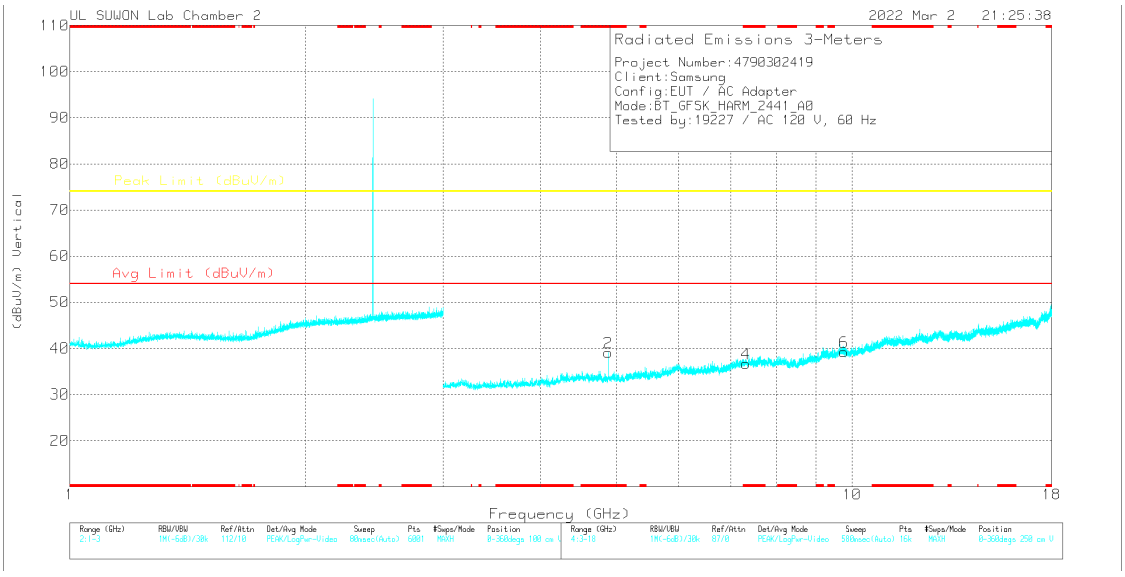
39 CHANNEL RESULTS



HORIZONTAL



VERTICAL

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.88208	42.1	PKFH	34.1	-27.8	48.4	-	-	74	-25.6	313	100	H
* 4.88204	37.86	VA1T	34.1	-27.8	44.16	54	-9.84	-	-	313	100	H
* 4.88177	38.64	PKFH	34.1	-27.8	44.94	-	-	74	-29.06	33	118	V
* 4.88197	30.88	VA1T	34.1	-27.8	37.18	54	-16.82	-	-	33	118	V
* 7.33142	33.9	PKFH	36.1	-24.8	45.2	-	-	74	-28.8	0	100	H
* 7.32124	34.02	PKFH	36.1	-24.9	45.22	-	-	74	-28.78	0	100	V
9.75614	30.71	PKFH	37.2	-21.4	46.51	-	-	74	-27.49	0	100	H
9.76092	31.19	PKFH	37.2	-21.5	46.89	-	-	74	-27.11	0	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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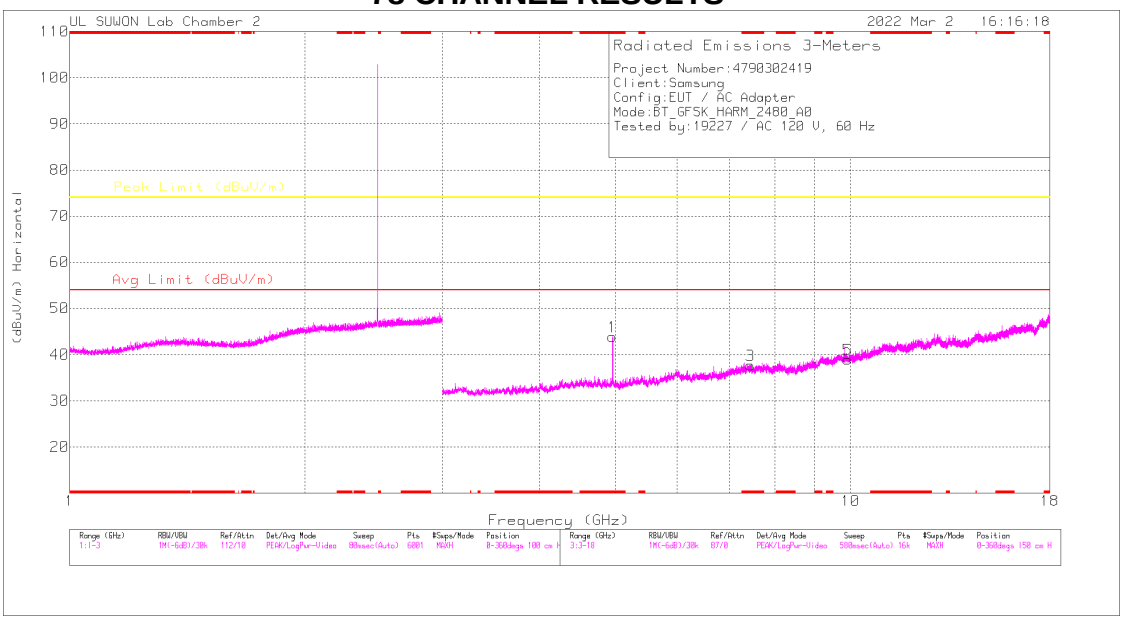
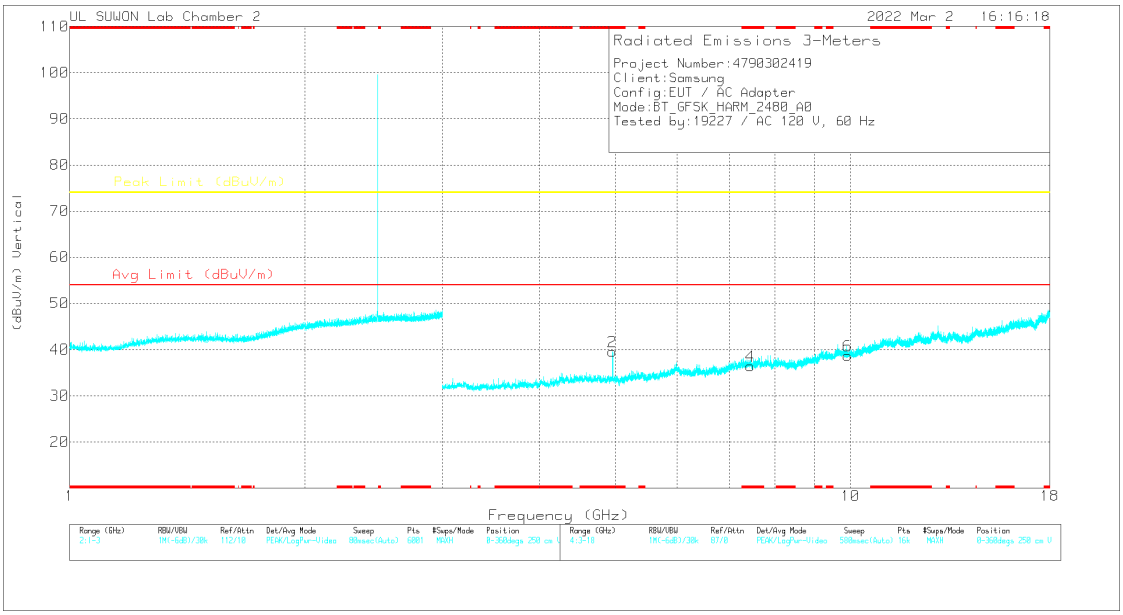
78 CHANNEL RESULTS



HORIZONTAL



VERTICAL

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0016872 4	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.96011	40.89	PKFH	34.1	-27.2	47.79	-	-	74	-26.21	312	101	H
* 4.96005	36.44	VA1T	34.1	-27.2	43.34	54	-10.66	-	-	312	101	H
* 4.96033	38.18	PKFH	34.1	-27.2	45.08	-	-	74	-28.92	42	123	V
* 4.96009	32.23	VA1T	34.1	-27.2	39.13	54	-14.87	-	-	42	123	V
* 7.44115	32.61	PKFH	36	-24.1	44.51	-	-	74	-29.49	360	101	H
* 7.44027	32.52	PKFH	36	-24.1	44.42	-	-	74	-29.58	360	100	V
9.92178	30.96	PKFH	37.4	-21.2	47.16	-	-	74	-26.84	360	100	H
9.92149	29.84	PKFH	37.4	-21.2	46.04	-	-	74	-27.96	360	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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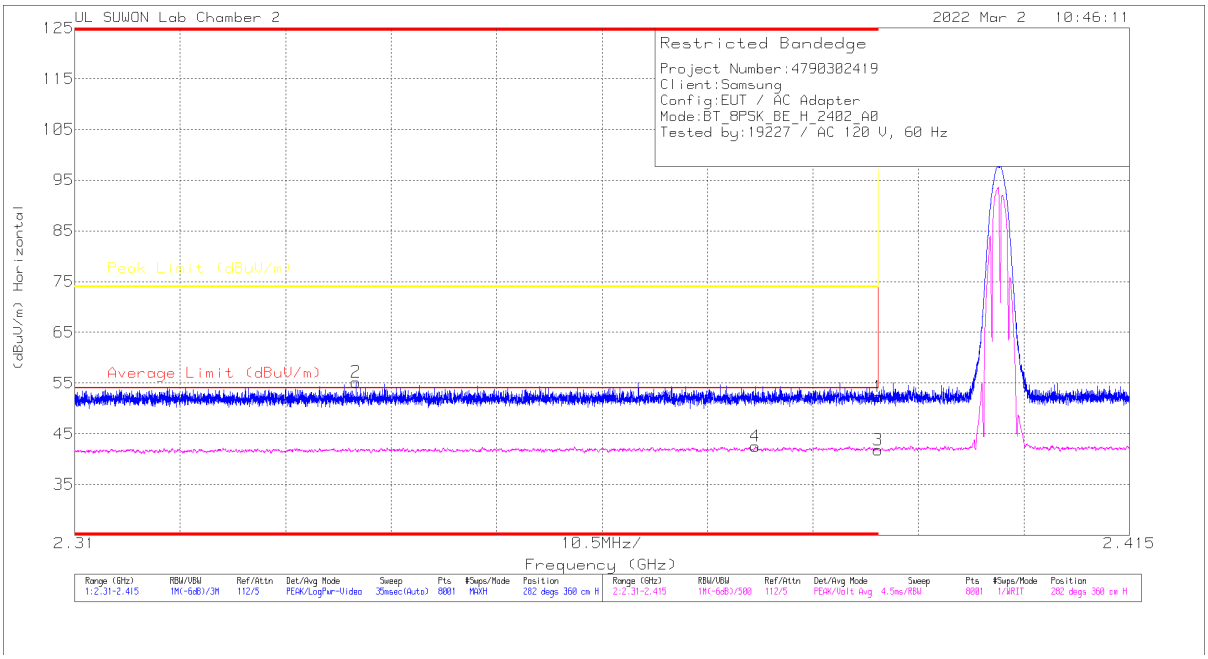
10.1.2. BLUETOOTH ENHANCED DATA RATE 8PSK MODULATION

BANDEDGE (0 CHANNEL)

HORIZONTAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.02	Pk	31.9	-20.6	52.32	-	-	74	-21.68	282	360	H
2	* 2.338	44.01	Pk	31.8	-20.6	55.21	-	-	74	-18.79	282	360	H
3	* 2.39	30.5	VA1T	31.9	-20.6	41.8	54	-12.2	-	-	282	360	H
4	* 2.37775	31.2	VA1T	31.9	-20.6	42.5	54	-11.5	-	-	282	360	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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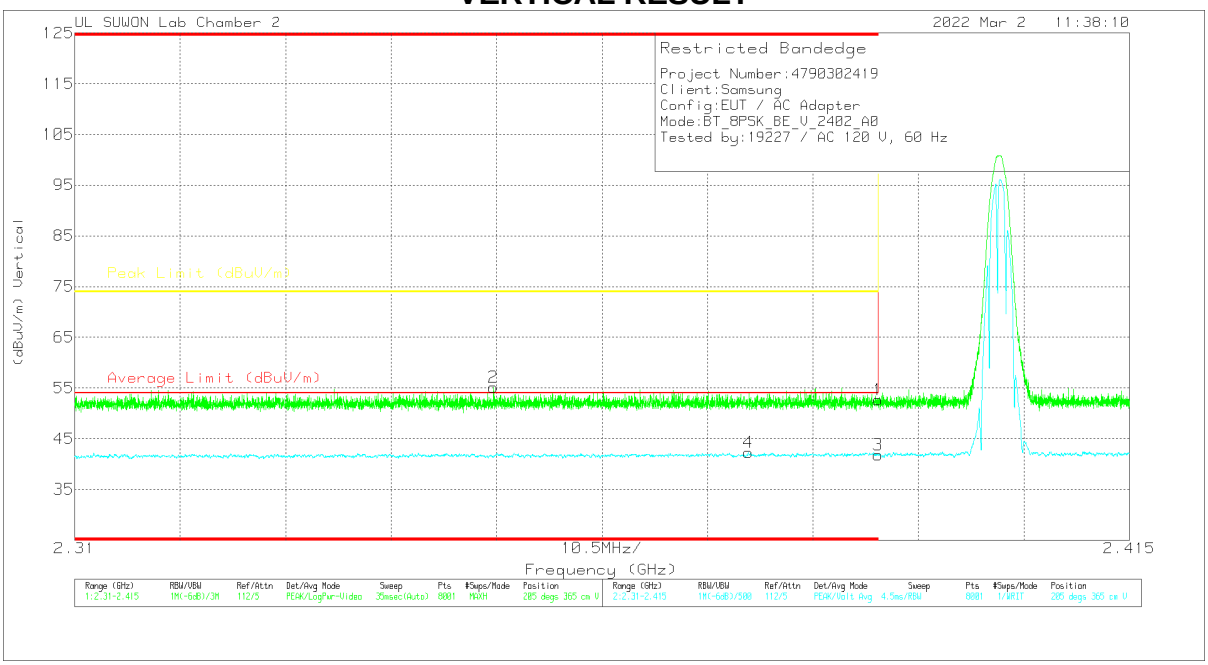
VERTICAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.39	41.35	Pk	31.9	-20.6	52.65	-	-	74	-21.35	205	365	V
2	* 2.3517	43.9	Pk	31.8	-20.6	55.1	-	-	74	-18.9	205	365	V
3	* 2.39	30.53	VA1T	31.9	-20.6	41.83	54	-12.17	-	-	205	365	V
4	* 2.37707	30.94	VA1T	31.9	-20.6	42.24	54	-11.76	-	-	205	365	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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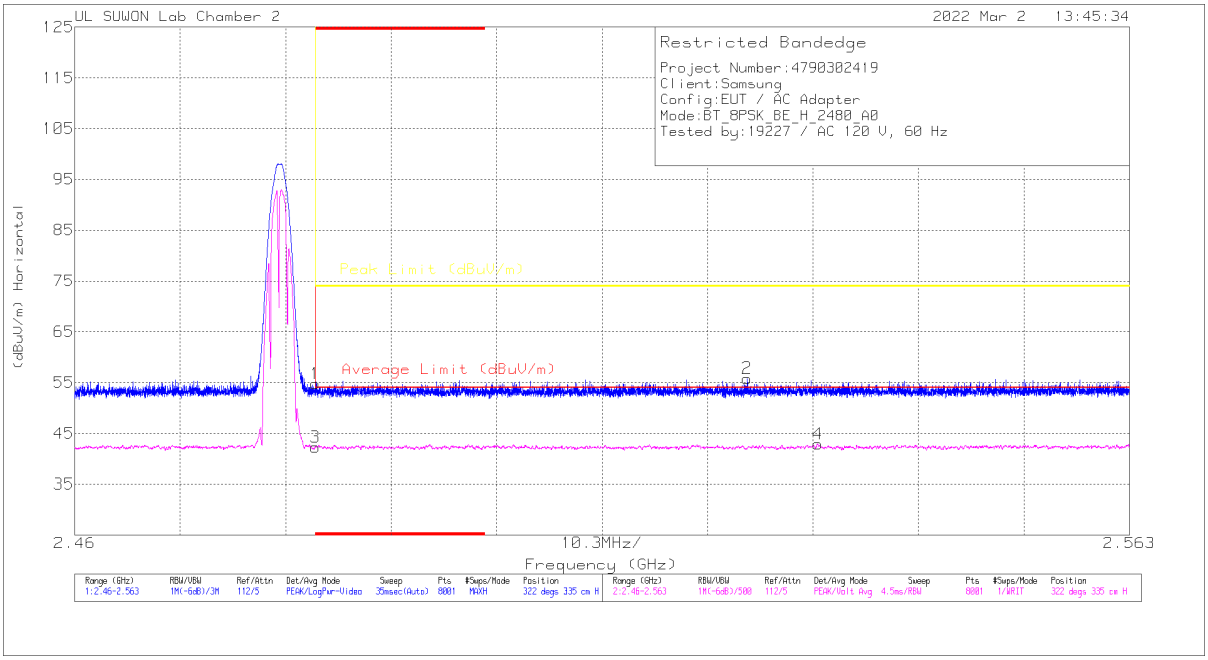
BANDEDGE (78 CHANNEL)

HORIZONTAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	43.2	Pk	32	-20.4	54.8	-	-	74	-19.2	322	335	H
2	2.52564	44.13	Pk	32.1	-20.4	55.83	-	-	74	-18.17	322	335	H
3	* 2.48351	30.71	VA1T	32	-20.4	42.31	54	-11.69	-	-	322	335	H
4	2.53255	31.06	VA1T	32.1	-20.3	42.86	54	-11.14	-	-	322	335	H

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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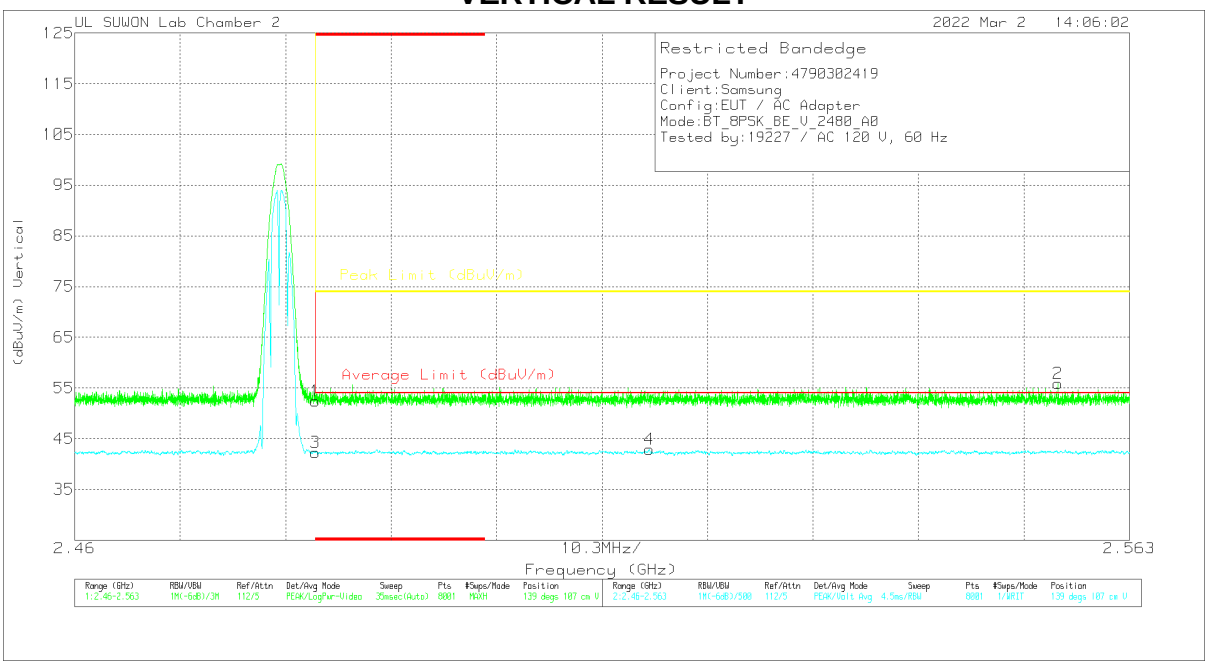
VERTICAL RESULT



Trace Markers

Marker	Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	10dB_ATT[dB]	Corrected Reading (dBuV/m)	Average Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	PK Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	* 2.48351	40.78	Pk	32	-20.4	52.38	-	-	74	-21.62	139	107	V
2	2.55601	44.03	Pk	32.2	-20.3	55.93	-	-	74	-18.07	139	107	V
3	* 2.48351	30.72	VA1T	32	-20.4	42.32	54	-11.68	-	-	139	107	V
4	2.5161	31.15	VA1T	32.1	-20.4	42.85	54	-11.15	-	-	139	107	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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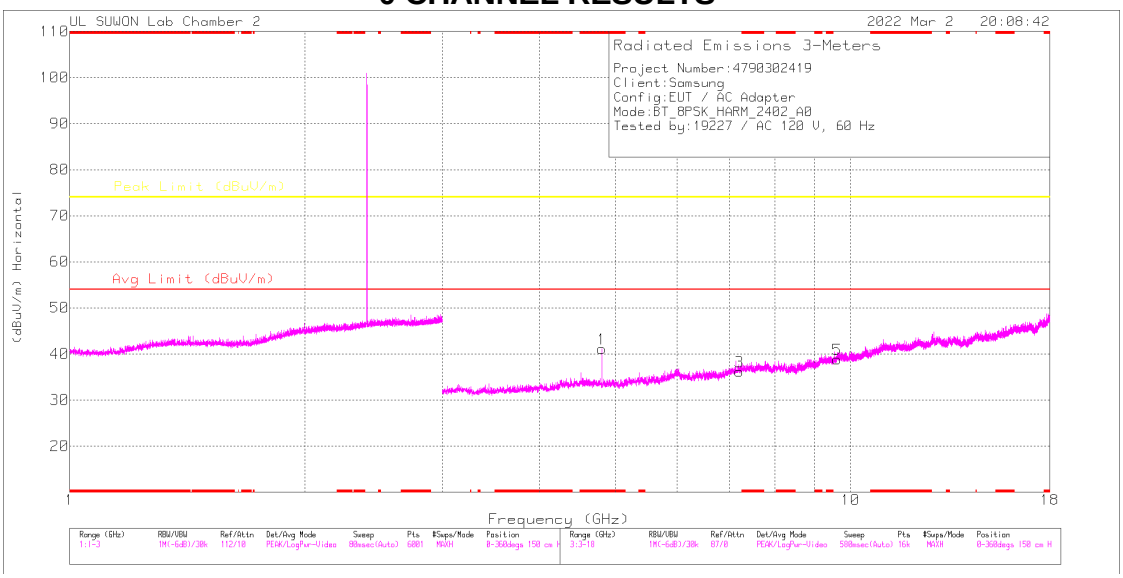
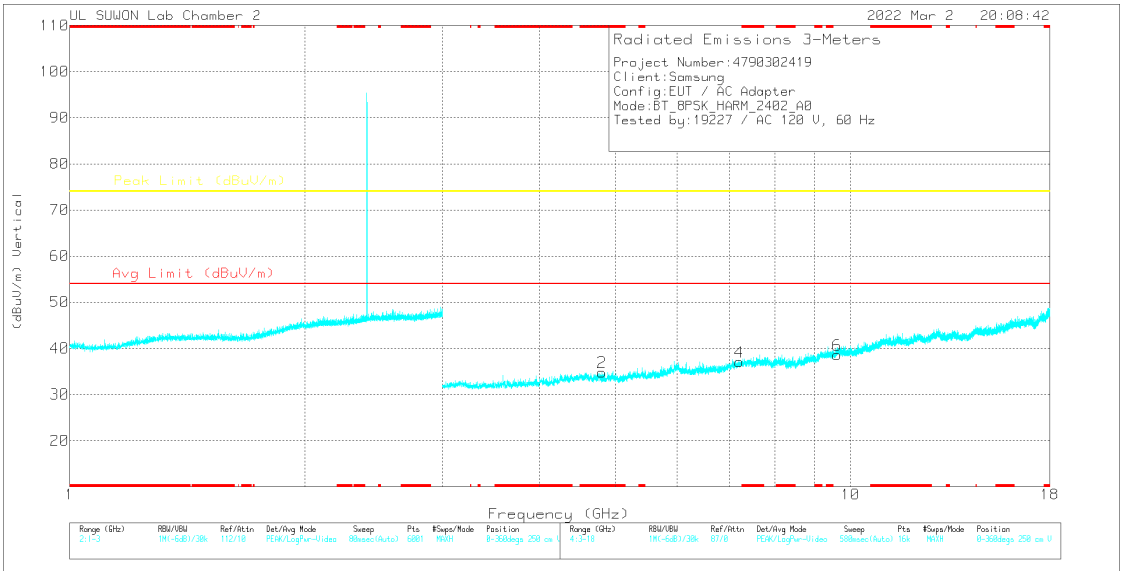
HARMONICS AND SPURIOUS EMISSIONS

0 CHANNEL RESULTS



HORIZONTAL



VERTICAL

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.80417	40.67	PKFH	34.1	-28	46.77	-	-	74	-27.23	316	108	H
* 4.80375	32.21	VA1T	34.1	-28	38.31	54	-15.69	-	-	316	108	H
* 4.80442	36.06	PKFH	34.1	-28	42.16	-	-	74	-31.84	26	100	V
* 4.80434	25.81	VA1T	34.1	-28	31.91	54	-22.09	-	-	26	100	V
7.20695	33.64	PKFH	36.2	-25.3	44.54	-	-	74	-29.46	0	100	H
7.20524	33.42	PKFH	36.2	-25.3	44.32	-	-	74	-29.68	0	100	V
9.60703	31.91	PKFH	37	-21.7	47.21	-	-	74	-26.79	0	100	H
9.61068	31.12	PKFH	37	-21.7	46.42	-	-	74	-27.58	0	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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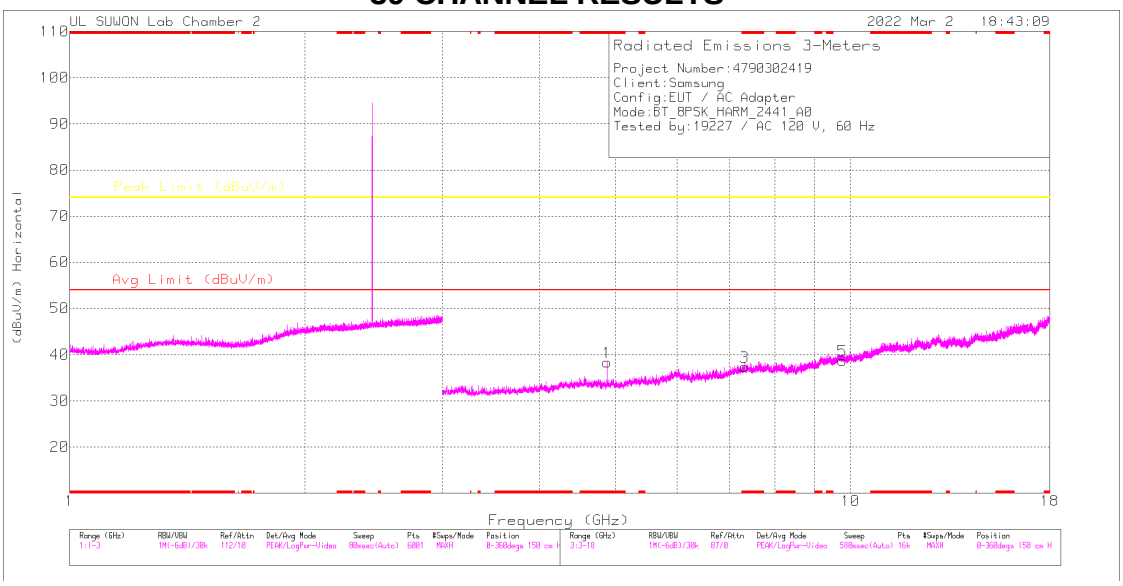
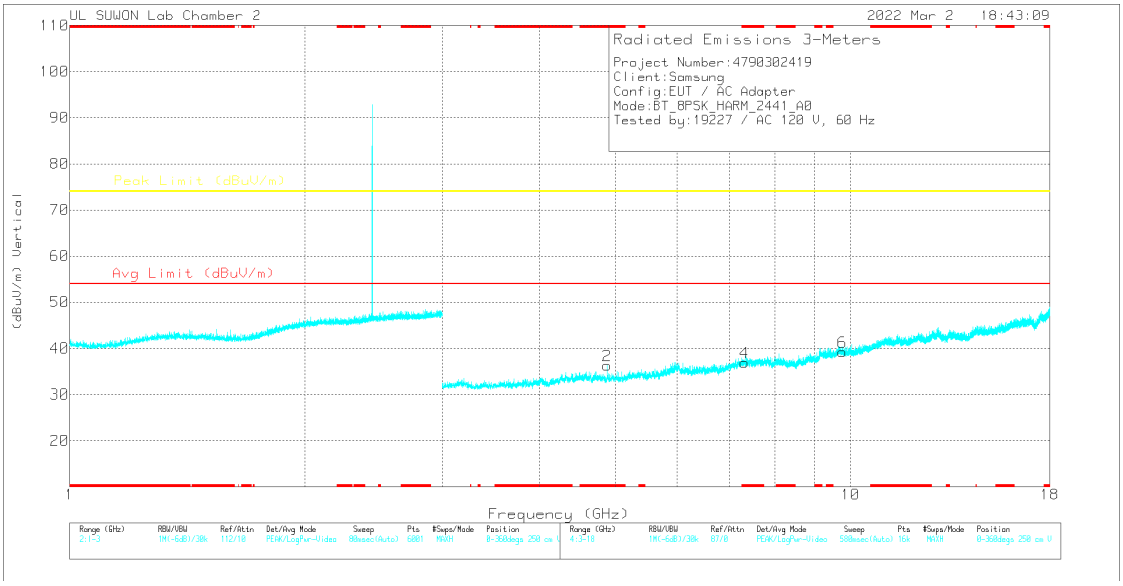
39 CHANNEL RESULTS



HORIZONTAL



VERTICAL

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_00168724	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.88145	34.64	PKFH	34.1	-27.8	40.94	-	-	74	-33.06	317	106	H
* 4.87992	23.83	VA1T	34.1	-27.8	30.13	54	-23.87	-	-	317	106	H
* 4.88179	37.68	PKFH	34.1	-27.8	43.98	-	-	74	-30.02	33	100	V
* 4.88185	27.94	VA1T	34.1	-27.8	34.24	54	-19.76	-	-	33	100	V
* 7.32148	33.19	PKFH	36.1	-24.9	44.39	-	-	74	-29.61	360	100	H
* 7.32275	33.67	PKFH	36.1	-24.9	44.87	-	-	74	-29.13	0	100	V
9.76643	30.81	PKFH	37.2	-21.5	46.51	-	-	74	-27.49	360	100	H
9.76215	30.89	PKFH	37.2	-21.5	46.59	-	-	74	-27.41	0	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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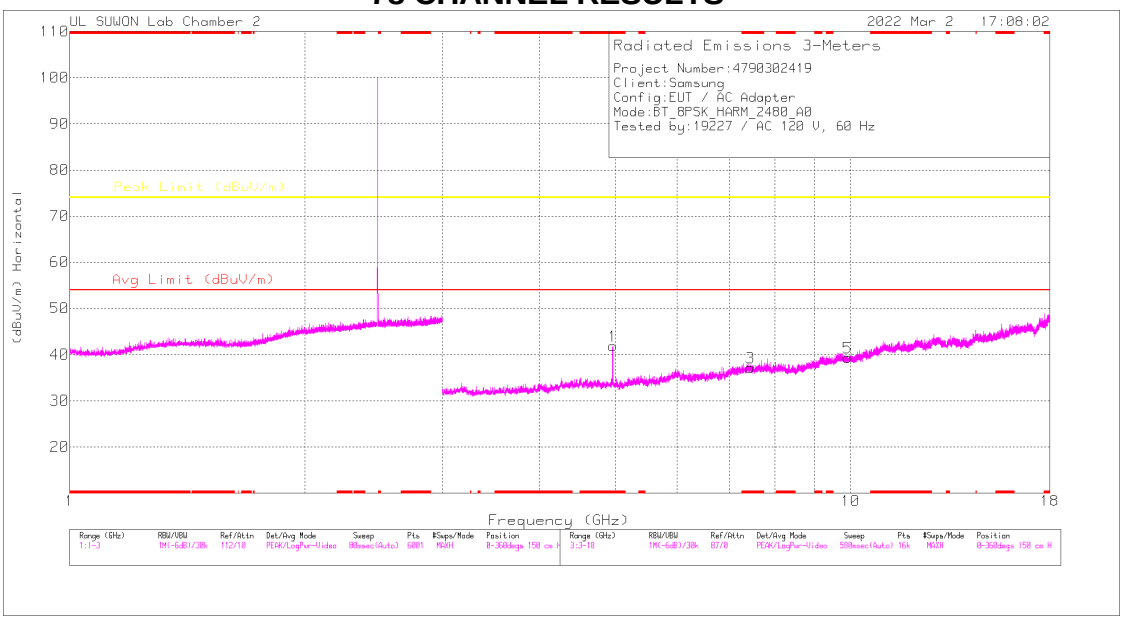
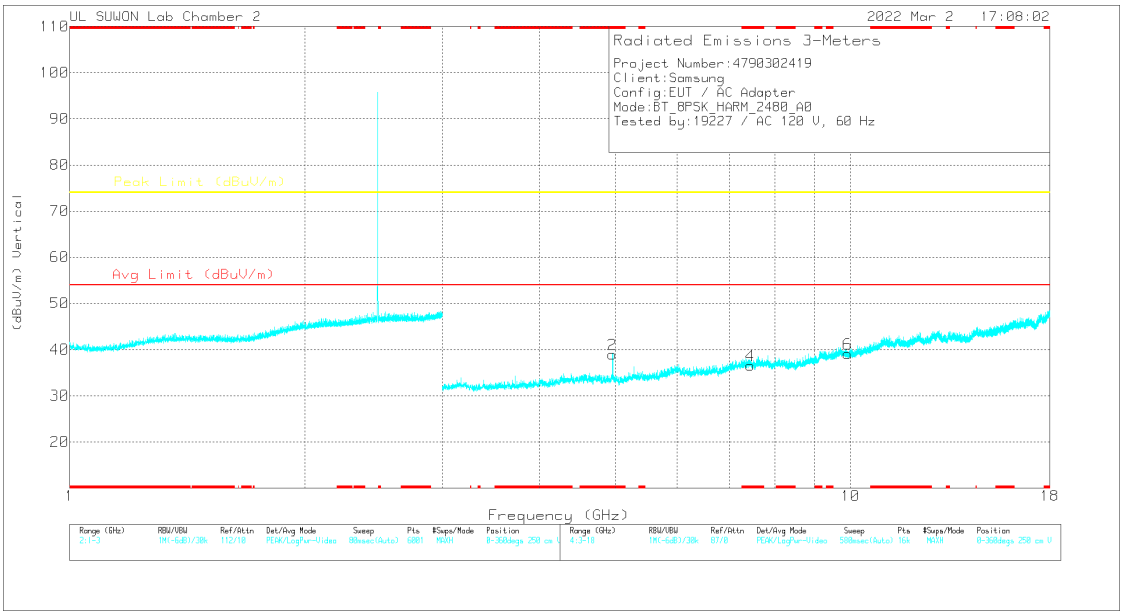
78 CHANNEL RESULTS



HORIZONTAL



VERTICAL

Radiated Emissions

Frequency (GHz)	Meter Reading (dBuV)	Det	3117_0016872 4	3GHz_HP[dB]	Corrected Reading (dBuV/m)	Avg Limit (dBuV/m)	Margin (dB)	Peak Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
* 4.96023	40.33	PKFH	34.1	-27.2	47.23	-	-	74	-26.77	311	101	H
* 4.96007	31.78	VA1T	34.1	-27.2	38.68	54	-15.32	-	-	311	101	H
* 4.96008	37.45	PKFH	34.1	-27.2	44.35	-	-	74	-29.65	37	125	V
* 4.96003	27.86	VA1T	34.1	-27.2	34.76	54	-19.24	-	-	37	125	V
* 7.43838	33.44	PKFH	36	-24.1	45.34	-	-	74	-28.66	360	100	H
* 7.44104	32.22	PKFH	36	-24.1	44.12	-	-	74	-29.88	0	100	V
9.91975	30.08	PKFH	37.4	-21.2	46.28	-	-	74	-27.72	360	100	H
9.92179	30.26	PKFH	37.4	-21.2	46.46	-	-	74	-27.54	0	100	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
PKFH FHSS/BT RB=100k for Frequencies<1GHz / RB=1MHz for Frequencies>1GHz, VB=3 x RB, Peak
VA1T - FHSS: Linear Voltage Average VB=1/Ton where: Ton is transmit duration

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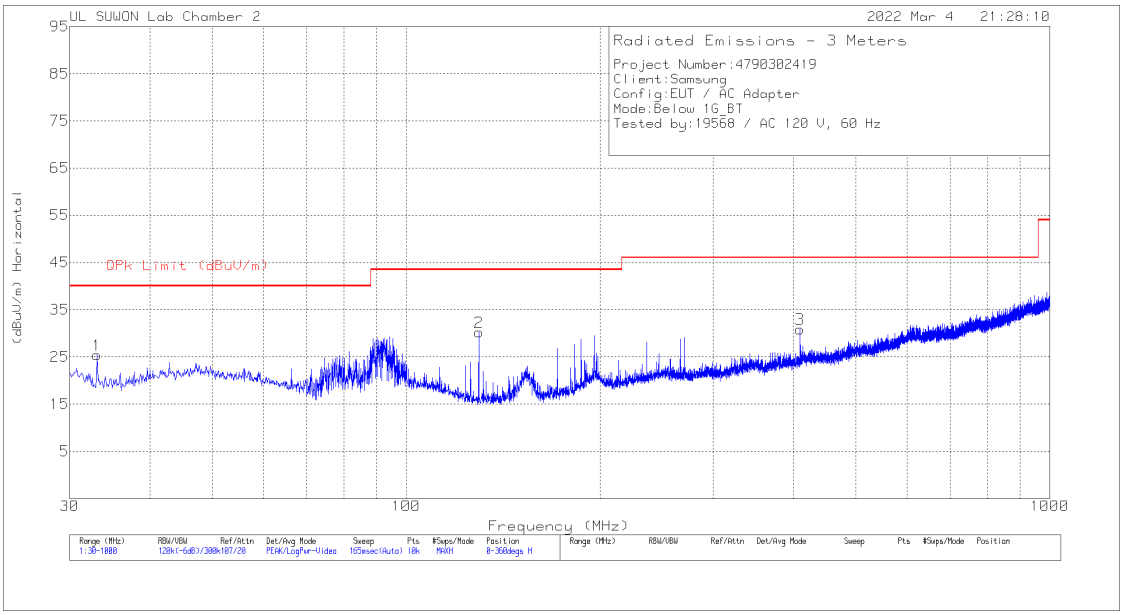
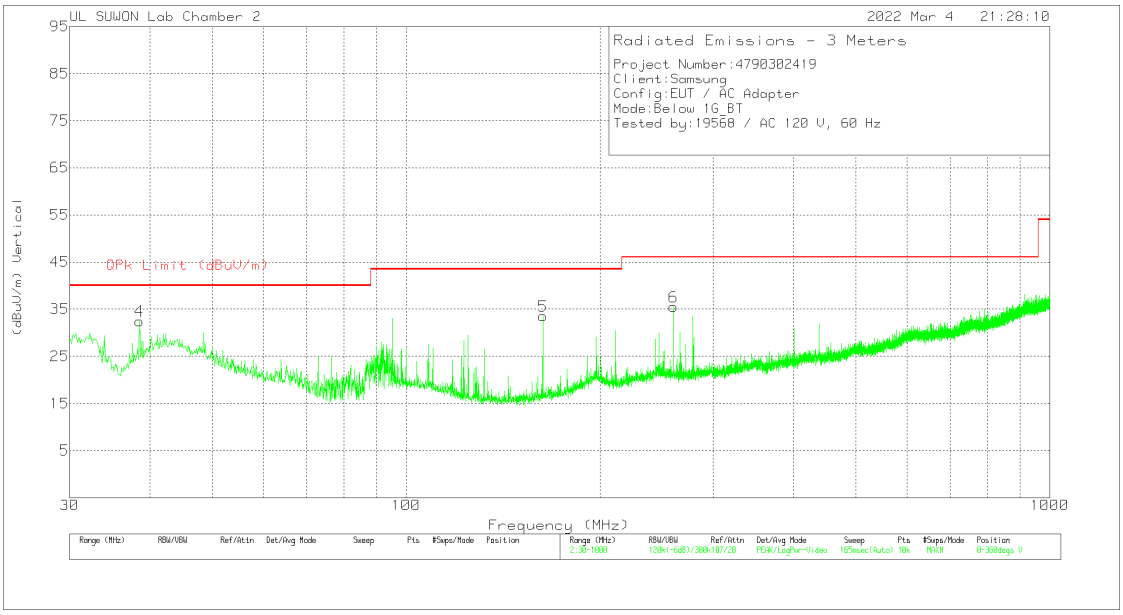
10.2. WORST CASE BELOW 1 GHz (USB C to C Cable)

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



HORIZONTAL



VERTICAL

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_749	Below 1G[dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	33.104	41.83	Pk	15.6	-32	25.43	40	-14.57	0-360	300	H
2	129.716	47.01	Pk	14.3	-31.1	30.21	43.52	-13.31	0-360	100	H
3	409.367	39.2	Pk	21.7	-30	30.9	46.02	-15.12	0-360	100	H
4	38.536	46.11	Pk	18.2	-31.8	32.51	40	-7.49	0-360	100	V
5	163.084	49.81	Pk	14.7	-30.9	33.61	43.52	-9.91	0-360	100	V
6	260.181	47.28	Pk	18.8	-30.5	35.58	46.02	-10.44	0-360	100	V

Pk - Peak detector

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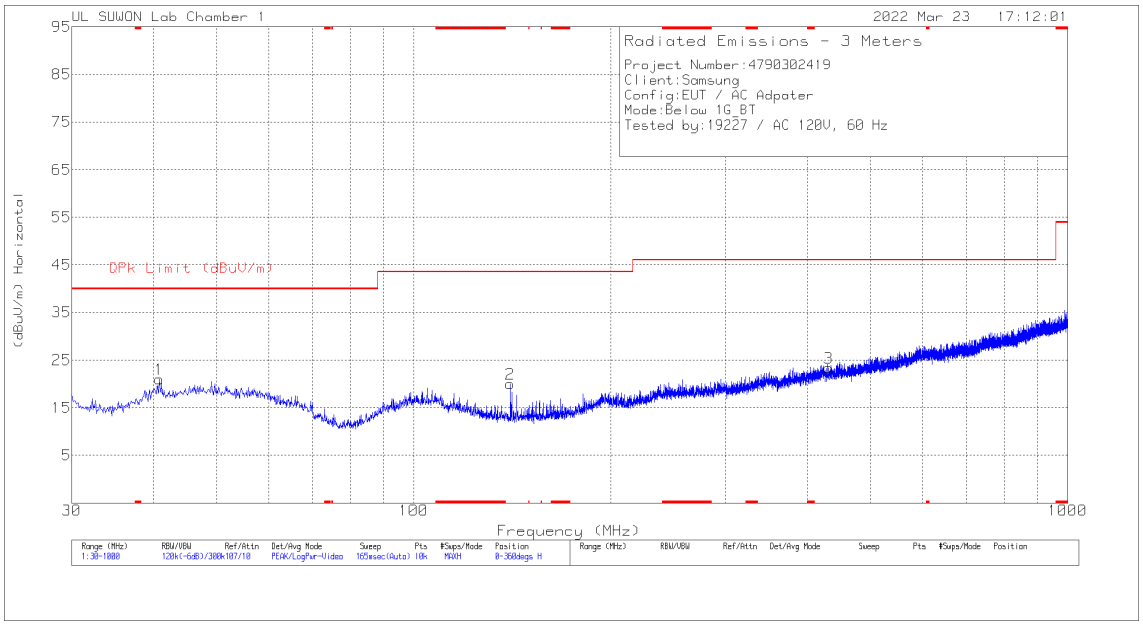
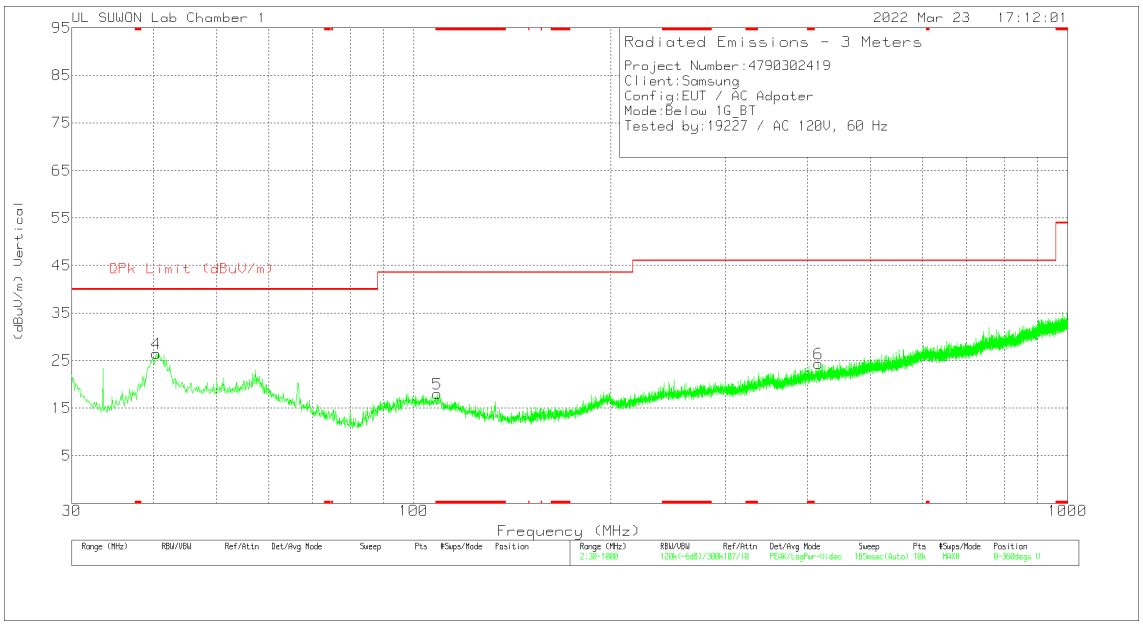
10.3. WORST CASE BELOW 1 GHz (USB A to C Cable)

SPURIOUS EMISSIONS 30 TO 1000 MHz (WORST-CASE CONFIGURATION)



HORIZONTAL



VERTICAL

Trace Markers

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	VULB9163_750	Below_1G[dB]	Corrected Reading (dBuV/m)	QPk Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)	Height (cm)	Polarity
1	40.864	33.05	Pk	18.9	-31	20.95	40	-19.05	0-360	200	H
2	140.58	36.05	Pk	13.8	-29.8	20.05	43.52	-23.47	0-360	100	H
3	430.998	29.08	Pk	22.1	-27.8	23.38	46.02	-22.64	0-360	100	H
4	40.379	38.68	Pk	18.8	-31	26.48	40	-13.52	0-360	200	V
5	* 108.764	30.81	Pk	17.4	-30.2	18.01	43.52	-25.51	0-360	200	V
6	415.963	30.5	Pk	21.8	-27.9	24.4	46.02	-21.62	0-360	300	V

* - indicates frequency in CFR47 Pt 15 / IC RSS-Restricted Band
Pk - Peak detector

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11. AC POWER LINE CONDUCTED EMISSIONS

LIMITS

FCC §15.207 (a)

RSS-Gen 8.8

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56 *	56 to 46 *
0.5-5	56	46
5-30	60	50

* Decreases with the logarithm of the frequency.

TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10:2013.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

RESULTS

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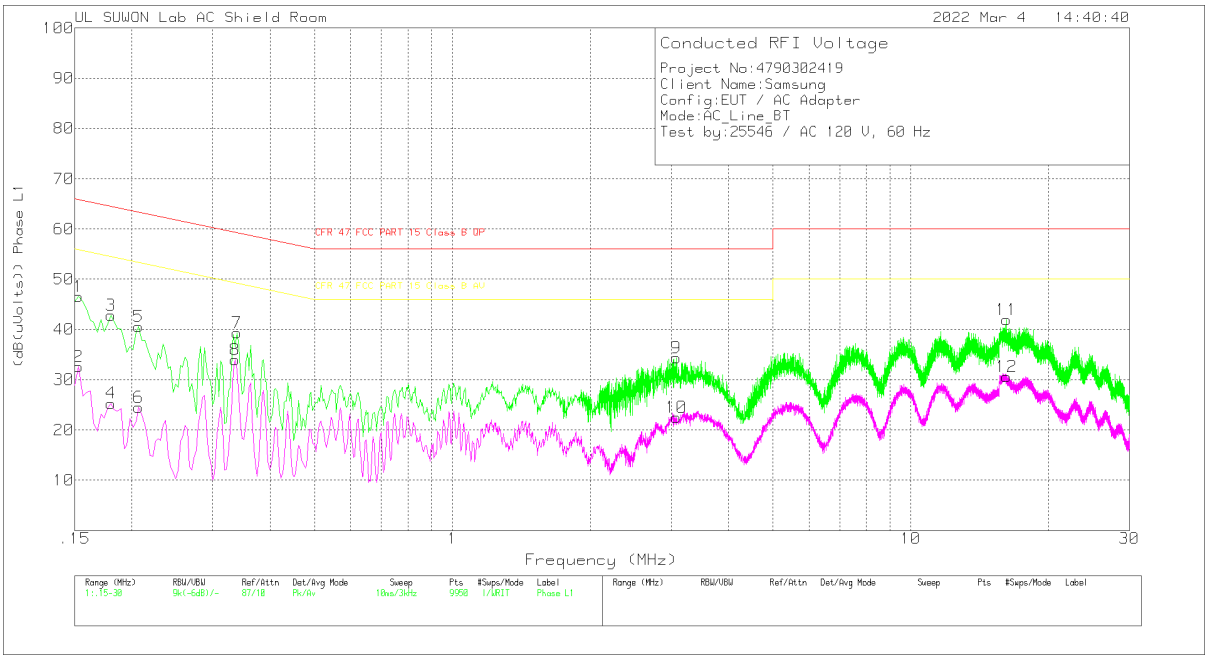
11.1. AC Power Line (USB C to C Cable)

LINE 1 RESULTS



Trace Markers

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_L1[dB]	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
1	.153	36.71	Pk	9.8	.1	46.61	65.84	-19.23	-	-
2	.153	22.68	Av	9.8	.1	32.58	-	-	55.84	-23.26
3	.18	32.78	Pk	9.9	.2	42.88	64.49	-21.61	-	-
4	.18	15.22	Av	9.9	.2	25.32	-	-	54.49	-29.17
5	.207	30.54	Pk	9.8	.2	40.54	63.32	-22.78	-	-
6	.207	14.51	Av	9.8	.2	24.51	-	-	53.32	-28.81
7	.339	29.3	Pk	9.8	.2	39.3	59.23	-19.93	-	-
8	.336	23.96	Av	9.8	.2	33.96	-	-	49.3	-15.34
9	3.081	24.32	Pk	9.7	.3	34.32	56	-21.68	-	-
10	3.081	12.55	Av	9.7	.3	22.55	-	-	46	-23.45
11	16.17	31.5	Pk	10	.4	41.9	60	-18.1	-	-
12	16.161	20.24	Av	10	.4	30.64	-	-	50	-19.36

Pk - Peak detector
Av - Average detection

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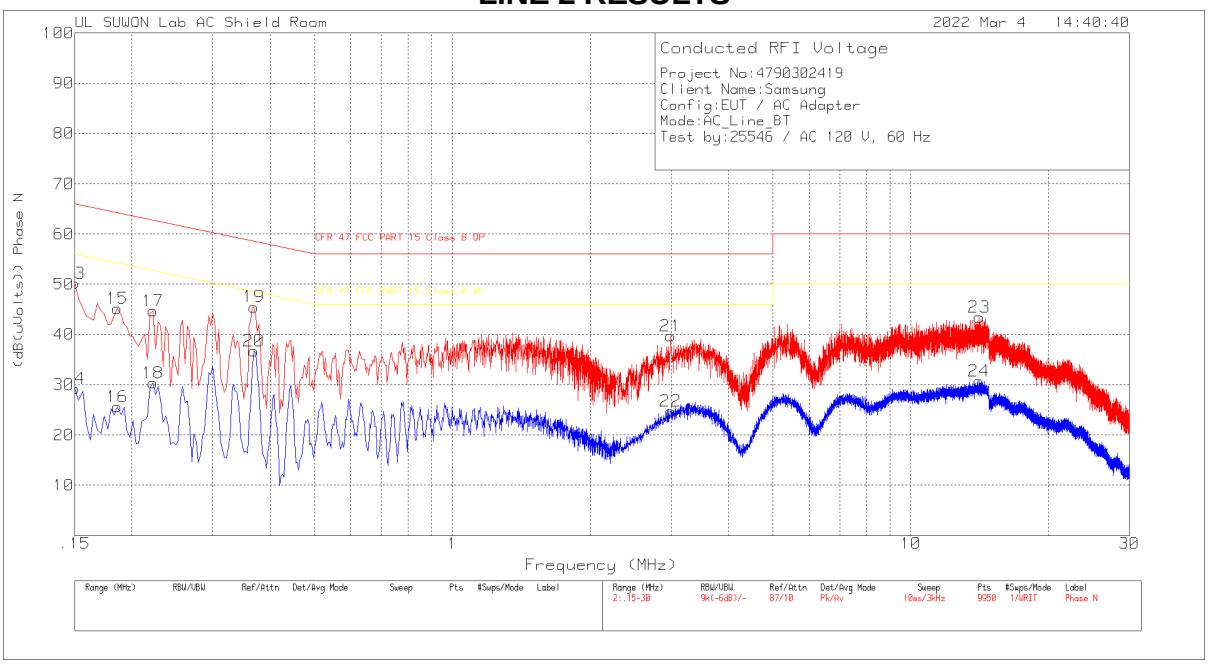
LINE 2 RESULTS



Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_N[dB]	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
13	.15	40.36	Pk	9.7	.1	50.16	66	-15.84	-	-
14	.15	19.47	Av	9.7	.1	29.27	-	-	56	-26.73
15	.186	35.15	Pk	9.9	.2	45.25	64.21	-18.96	-	-
16	.186	15.58	Av	9.9	.2	25.68	-	-	54.21	-28.53
17	.222	34.77	Pk	9.7	.2	44.67	62.74	-18.07	-	-
18	.222	20.42	Av	9.7	.2	30.32	-	-	52.74	-22.42
19	.369	35.51	Pk	9.8	.2	45.51	58.52	-13.01	-	-
20	.369	26.73	Av	9.8	.2	36.73	-	-	48.52	-11.79
21	2.997	29.76	Pk	9.7	.3	39.76	56	-16.24	-	-
22	2.997	14.81	Av	9.7	.3	24.81	-	-	46	-21.19
23	14.112	33.01	Pk	10	.4	43.41	60	-16.59	-	-
24	14.103	20.3	Av	10	.4	30.7	-	-	50	-19.3

Pk - Peak detector
Av - Average detection

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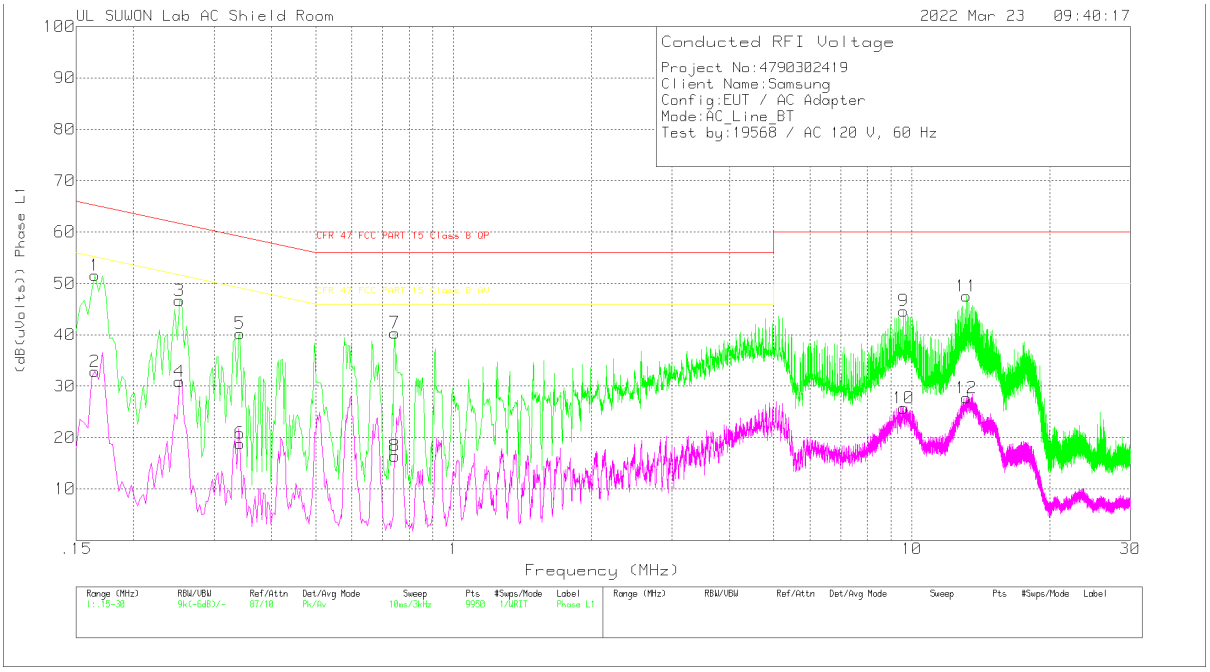
11.2. AC Power Line (USB A to C Cable)

LINE 1 RESULTS



Trace Markers

Range 1: Phase L1 .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_L1[dB]	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
1	.165	41.55	Pk	9.9	.1	51.55	65.21	-13.66	-	-
2	.165	22.86	Av	9.9	.1	32.86	-	-	55.21	-22.35
3	.252	36.87	Pk	9.6	.2	46.67	61.69	-15.02	-	-
4	.252	21.09	Av	9.6	.2	30.89	-	-	51.69	-20.8
5	.342	30.24	Pk	9.8	.2	40.24	59.15	-18.91	-	-
6	.342	8.86	Av	9.8	.2	18.86	-	-	49.15	-30.29
7	.744	30.34	Pk	9.8	.2	40.34	56	-15.66	-	-
8	.744	6.44	Av	9.8	.2	16.44	-	-	46	-29.56
9	9.603	34.46	Pk	9.8	.4	44.66	60	-15.34	-	-
10	9.603	15.54	Av	9.8	.4	25.74	-	-	50	-24.26
11	13.155	37.22	Pk	9.9	.4	47.52	60	-12.48	-	-
12	13.155	17.4	Av	9.9	.4	27.7	-	-	50	-22.3

Pk - Peak detector
Av - Average detection

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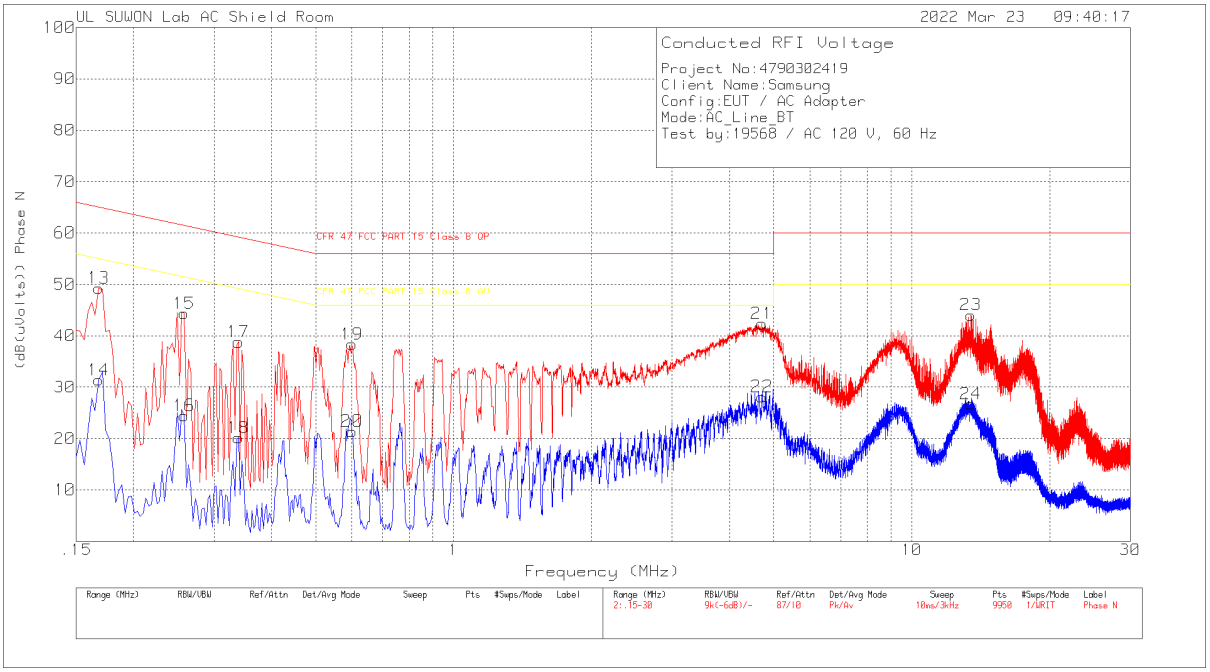
LINE 2 RESULTS



Trace Markers

Range 2: Phase N .15 - 30MHz

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	101836_With EX_N[dB]	CABLELOSS(dB)	Corrected Reading (dB(uVolts))	CFR 47 FCC PART 15 Class B QP	Margin (dB)	CFR 47 FCC PART 15 Class B AV	Margin (dB)
13	.168	39.17	Pk	10	.1	49.27	65.06	-15.79	-	-
14	.168	21.29	Av	10	.1	31.39	-	-	55.06	-23.67
15	.258	34.53	Pk	9.6	.2	44.33	61.5	-17.17	-	-
16	.258	14.64	Av	9.6	.2	24.44	-	-	51.5	-27.06
17	.339	28.81	Pk	9.8	.2	38.81	59.23	-20.42	-	-
18	.339	10.15	Av	9.8	.2	20.15	-	-	49.23	-29.08
19	.6	28.26	Pk	9.9	.2	38.36	56	-17.64	-	-
20	.6	11.32	Av	9.9	.2	21.42	-	-	46	-24.58
21	4.71	32.36	Pk	9.7	.3	42.36	56	-13.64	-	-
22	4.71	18.12	Av	9.7	.3	28.12	-	-	46	-17.88
23	13.449	33.64	Pk	10	.4	44.04	60	-15.96	-	-
24	13.449	16.34	Av	10	.4	26.74	-	-	50	-23.26

Pk - Peak detector
Av - Average detection

END OF TEST REPORT

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